Auxier & Associates, Inc.

Radiological Health, Safety and Environmental Services

A USA Environment, L.P. Company

SURFACE RIM IDENTIFICATION SAMPLING AND ANALYSIS PLAN (SAP)

WEST LAKE SUPERFUND SITE OPERABLE UNIT 1

December 2015

PREPARED BY:

AUXIER & ASSOCIATES, INC.
9821 COGDILL ROAD, SUITE 1
KNOXVILLE, TN 37932
(865) 675-3669 FAX: (865) 675-3677

&

ENGINEERING MANAGEMENT SUPPORT, INC.
7220 W. JEFFERSON AVE, SUITE 406
LAKEWOOD, CO 80235

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SURFACE RIM IDENTIFICATION
SAMPLING AND ANALYSIS PLAN (SAP)

SIGNATURES:

Prepared by Cecilia Greene, Auxier& Associates

_____ 1/4/16 _____,

Signature **Date**

Approved by Paul Rosasco, Project Coordinator EMSI

_____ _____,

Signature **Date**

Approved by Diane Harris, EPA Region 7 QA Manager

_____ _____,

Signature **Date**

A&A and EMSI are authorized to sign in lieu of Operable Unit 1 Respondents.

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DISTRIBUTION LIST

NAME	RESPONSIBILITY	AFFILIATION
Paul Rosasco, P.E.	Project Coordinator	EMSI
Robert Jelinek	Project Coordinator (Respondents)	EMSI
Daniel Feezor, P.E.	Lead Project Engineer	Feezor Engineering, Inc.
Jonathan Wilkinson, P.E.	Lead Field Engineer	Feezor Engineering, Inc.
Paul Eastvold	Site Safety and Health	Feezor Engineering, Inc.
Michael Bollenbacher, CHP	Radiation Safety Officer	Auxier & Associates
Cecilia Greene, MPH	Health Physics Project Manager	Auxier & Associates
Alex Luna	Site Health Physics Technician	Auxier & Associates
Collin Carson	Lead Surveyor	Weaver Consultants Group
	Construction Contractor TBD	

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1. INTRODUCTION

This Sampling and Analysis Plan (SAP) ("Plan") describes the activities and quality requirements associated with the survey, sampling, and construction activities which will be performed at the West Lake Landfill Superfund Site in Bridgeton, Missouri, as required by the December 9, 2015 Unilateral Administrative Order for Removal Action issued by the U.S. Environmental Protection Agency (EPA) to Bridgeton Landfill, LLC, Rock Road Industries, Inc., and Cotter Corporation (N.S.L.) (Respondents). The activities implemented under this Plan are intended to define the extent of surface RIM in Operable Unit 1 (OU1) Areas 1 and 2 for the purposes of covering the surface RIM with a non-combustible cover.

1.1 PURPOSE AND SCOPE

The purpose of this Sampling and Analysis Plan (SAP) is to describe survey activities, soil sample collection and analysis, and establish the quality objectives for activities associated with covering surface RIM in OU1 (USEPA 2015). This SAP includes all required elements for a field sampling plan (FSP) and a Quality Assurance Project Plan (QAPP). The scope of this SAP was developed following applicable United States Environmental Protection Agency (EPA) protocols outlined in EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA 2001).

This SAP describes the survey objectives, sampling objectives, data quality objectives (DQO), approach to sampling, and measurement methods to support the construction of a non-combustible cover over surface RIM in OU1.

1.2 SITE DESCRIPTION

The West Lake Landfill Superfund Site is located at 13570 St. Charles Rock Road in Bridgeton, St. Louis County, Missouri, approximately one mile north of the intersection of Interstate 70 and Interstate 270. The site is divided into two Operable Units. Operable Unit-1 (OU1) is composed of the two disposal areas (Area 1 and Area 2) where radionuclides are mixed with landfilled soil and solid waste materials. Operable Unit-2 (OU2) consists of the remainder of the site and includes several inactive landfilled areas containing sanitary waste or demolition debris, a solid waste transfer station, an asphalt batch plant, and a permitted sanitary landfill (the Bridgeton Sanitary Landfill), which stopped receiving waste on December 31, 2004. The Bridgeton Sanitary Landfill is a quarry-fill landfill containing municipal waste, and consists of the North Quarry and South Quarry landfill units. Since late 2010, the Bridgeton Sanitary Landfill South Quarry unit has experienced a subsurface smoldering event (SSE). The southern border of OU1 Area 1 is contiguous with the North Quarry cell of the Bridgeton Sanitary Landfill. OU1 Area 2 is located along the northern portion of the overall site, approximately 1,000 feet (at the closest point) from the outer boundary of the North Quarry landfill unit, and is separated from it by a road and by the closed demolition landfill (See Figure 1).

Land use surrounding the site is primarily commercial and industrial, with residential uses located approximately ½ mile to the south of the site (the Spanish Village subdivision) and approximately ½ mile to the south east (the Terrisan Reste mobile home park)..

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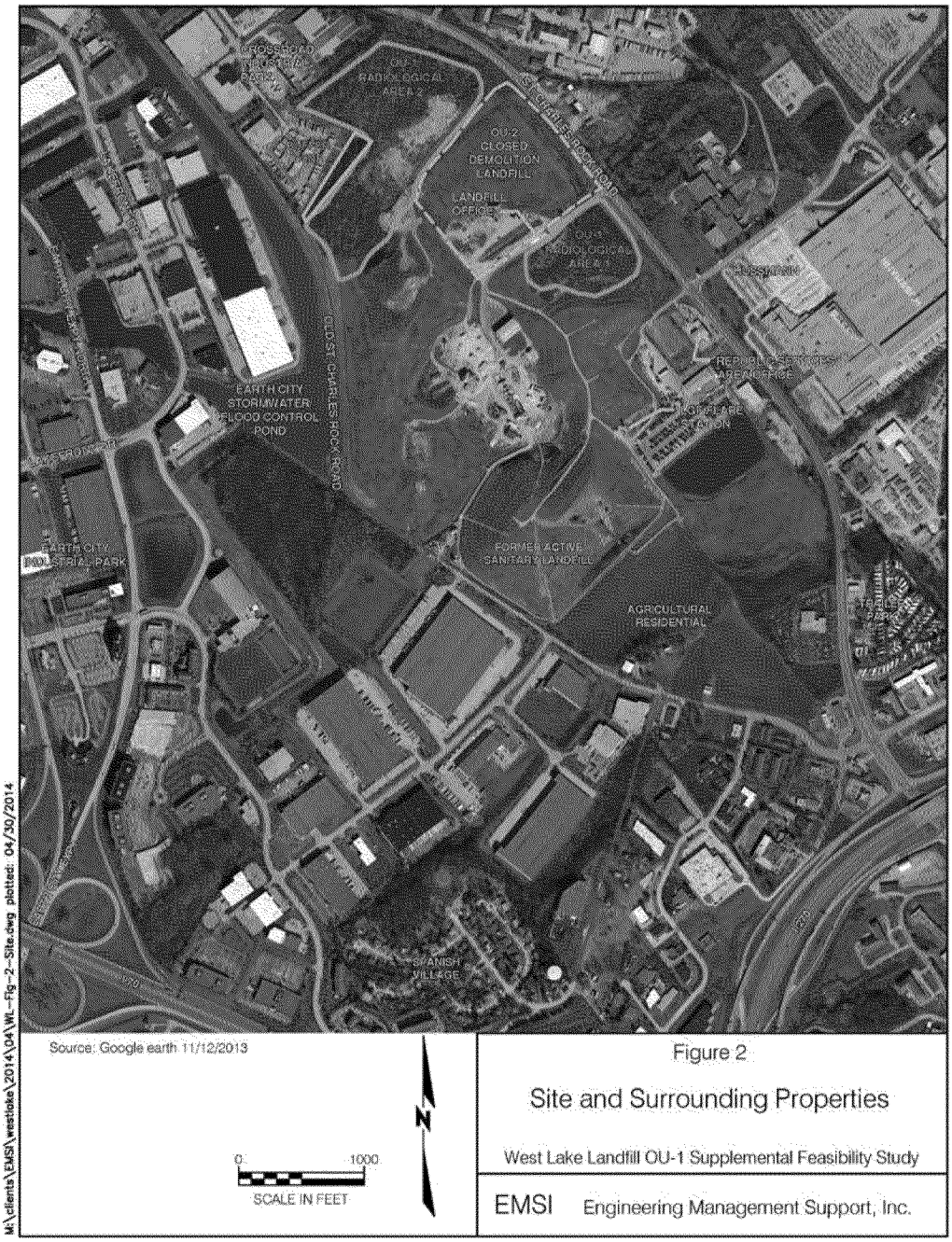

Figure 1 West Lake Landfill Superfund Site

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1.3 PROJECT/TASK ORGANIZATION

The project team will consist primarily of contractors that have previously been working in Areas 1 and 2 along with a construction contractor to be retained to perform the vegetation clearing and placement of the NCC.

Engineering Management Support, Inc. (EMSI) will provide overall coordination of the work including coordination of preparation of project plans, coordination of the various contractors, and coordination with EPA. Specifically, Paul Rosasco, P.E., with assistance from Robert Jelinek, P.E., will serve as the overall Project Coordinator for the Respondents. EMSI will also be responsible for preparation of monthly progress reports and overall coordination of the final report for the NCC installation project.

Feezor Engineering, Inc. (FEI) will provide office and field engineering services including preparation of design and record drawings, supervision and documentation of field activities and collection of confirmation surface soil samples. Daniel Feezor, P.E., will serve as lead Project Engineer and Jonathan Wilkinson, P.E. will be lead Field Engineer for this project. FEI will also perform post-installation construction inspections to identify any maintenance or repair activities that may be required.

Auxier & Associates, Inc. (Auxier) will provide health physics services including performance of radiation surveys including but not limited to overland gamma surveys, perimeter air monitoring, occupational monitoring during NCC construction, and free release surveys for equipment exiting Area 1 or 2. Michael R. Bollenbacher, Certified Health Physicist (CHP) will serve as lead health physicist and radiation safety officer. Mr. Bollenbacher will be assisted by Cecilia Greene, MPH who will serve as the Health Physics project manager. Alex Luna will be the on-site health physics technician and site safety officer. Auxier will be responsible for implementation of the project health and safety and radiation safety plans for this work.

Weaver Consultants Group (Weaver) will survey the locations where confirmation surface soil samples are collected, provide survey control during construction, and survey the outer limits of the final, installed NCC. Collin Carson will serve as lead surveyor for the NCC installation project.

Construction Contractor (TBD) – A construction contractor will be retained by the OU-1 Trust Group to clear the vegetation and install the NCC. The specific contractor to be retained to perform this work will be selected based on a competitive bid process. The Respondents will notify EPA of the name of the contractor upon completion of the bidding process

1.4 PROJECT SCHEDULE AND DELIVERABLES

The non-combustible cover field activities are expected to occur in the first quarter of 2016. A report summarizing the activities will be completed after analytical data has been received and validated, in accordance with the timeframes and content specified in Paragraph 42 of the UAO.

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1.5 PROJECT/TASK DESCRIPTION

The project tasks encompassed within this SAP include:

- Identifying inaccessible areas and performing brush clearing.
- Identifying areas of soil producing gamma radiation that is at a defined factor above background levels. Radiological surveys in Areas 1 and 2 will be performed using Ludlum 44-10 (2X2) Sodium Iodide (NaI) detectors coupled to Ludlum 2221 survey meters modified to integrate and transfer data from the detector at a rate of once per second to a Trimble GeoPositioning Systems (GPS) which stores the gamma reading and the location of that reading. The detectors will be hung approximately six-inches above the ground surface and advanced at a rate of 0.5 meters per second. Separation between the scanned transit lines will be approximately 1.5 meters unless influenced by terrain. Stored data will be downloaded and processed using commercially available software applications and plotted on a map of the Areas. Individual points will be assigned colors based on the magnitude of the instrument's response at that location.
- Using the maps generated by the walk-over survey to identify remaining inaccessible areas and evaluate the feasibility of making the remaining inaccessible areas accessible by brush clearing.
- Performing surface soil sampling, as necessary, outside the perimeter of the identified surface RIM to verify that hard-to-detect[1] radionuclides are not present. .
- Submitting samples for quick turn-around-time (TAT) isotopic thorium analysis. The quick TAT isotopic thorium analyses will allow for cover expansion if necessary. The samples will also be analyzed for isotopic uranium and gamma spectroscopy at a more economical rate.
- Sampling and analyzing flora to establish the concentrations of radiological constituents in vegetation covering Areas 1 and 2.
- Constructing a non-combustible cover that extends approximately 10 feet beyond the perimeter of identified surface RIM.

1.6 CONSTITUENTS OF CONCERN

West Lake Landfill contains both municipal solid waste and construction and demolition wastes. A Baseline Risk Assessment (BRA) was published in 2000 and identified the radionuclides of concern at the West Lake Landfill. That document determined isotopes of uranium and thorium and their decay products to be the constituents of concern (COCs) sampled for under this Plan.

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[1] A "hard-to-detect radionuclide" is one that is not easily detected by portable instrumentation. In this case, instrument scans will be essentially ineffective when looking for Th-230.

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Two of these radioisotopes (thorium-230 and radium-226) contributed the majority of the calculated risk reported in the BRA.

The combination of radium-226 and its decay products found at the Site produces a relatively strong gamma signal that is readily measurable by hand-held gamma instrumentation. Thorium-230 is not found in equilibrium with its decay products at the site, and it is not detectable by hand-held gamma instruments. Thorium-230's alpha emissions can be detected by its alpha emissions, but alpha detection while moving over uneven soil surfaces is a slow, difficult process compared to gamma detection. This makes thorium-230 a "hard-to-detect" radionuclide for outdoor gamma scans.

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2. DATA QUALITY OBJECTIVES

The Data Quality Objective (DQO) process improves the survey effectiveness and efficiency, and improves the defensibility of decisions. DQOs are developed to clarify the radiological survey objective, define the data that should be collected to satisfy the objective, define performance requirements, and specify limits on decision errors to ensure that quality information is obtained from the data.

2.1 STEP 1: STATE THE PROBLEM

As discussed above, OU1 of the Site is composed of two disposal areas (Area 1 and Area 2) where radionuclides are mixed with landfilled soil and solid waste materials. A recent small surface fire has raised concerns regarding the presence of surface/uncovered RIM in the event of a more extensive surface fire. There are also concerns regarding the concentration of naturally-occurring radioactive material (NORM) in vegetation that may ignite in such a fire.

2.2 STEP 2: IDENTIFY THE DECISION

The purpose of this step is to establish the principal questions, the decisions to be made, and measurements inputs.

The principal questions to be addressed in this Project include:

1. What portable radiological survey instrumentation response is considered 2 times the median response to gamma radiation in a non-impacted area,

2. Are there any inaccessible areas for survey in the impacted areas, and can they be made accessible,

3. What is the lateral extent of the surface RIM in Areas 1 and 2 as indicated by the gamma scan,

4. Are there hard-to-detect radionuclides on the surface beyond the perimeter of the RIM as indicated by the gamma scans,

5. If the EPA determines that previous vegetation studies are not sufficient to demonstrate that the remaining vegetation does not pose a threat of release of radionuclides in the event of a fire, the concentration of radioisotopes in remaining vegetation may be included as a principle study question.

2.3 STEP 3: IDENTIFY THE INPUTS TO THE DECISION

This step identifies the information and measurements needed to resolve the decision statements. The data needed to achieve the objectives of this effort consist of accurate and reliable radiological survey information and measures of radionuclide concentrations in background soil and Areas of Concern (AOCs). The following sections identify key attributes of the data needed for this effort.

The following types of inputs are needed:

1. Results of radiological surveys paired with GPS location data in a non-impacted area,

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2. Results of radiological surveys paired with GPS location data in the AOCs (input for principal study questions 3 and 4),

3. Soil samples that are representative of the concentrations of hard to detect radionuclides around the RIM perimeter as identified by gamma scans.

4. The concentration of remaining vegetation, if necessary.

2.4 STEP 4: DEFINE THE STUDY BOUNDARIES

This step establishes the study boundaries, defines the population of interest, and defines the geographical area.

2.4.1 Media

The media of interest are surface and near-surface soils (0-6 in) and potentially flora samples from Bridgton Landfill impacted and non-impacted areas.

2.4.2 Geographical Areas

The geographical areas under consideration are non-impacted areas and Areas 1 and 2 of OU1 at the Bridgeton Landfill site.

2.4.3 Time Frame

Quick TAT sample results are necessary to ensure that the cover has adequately encompassed the surface RIM prior to construction demobilization. Surface soil samples will be submitted to Eberline Analytical Laboratory (Eberline) for quick turn-around-time (TAT) isotopic thorium analysis. The quick TAT isotopic thorium analyses will allow for an initial, quick determination as to whether the extent of NCC is sufficient or if placement of additional NCC may be required while the NCC contractor is still present at the site. The samples will also be analyzed for isotopic uranium and gamma spectroscopy in order to provide data comparable to the other investigatory data obtained from OU-1 areas.

If requested by the EPA, vegetation samples will collected and analyzed for isotopic thorium, uranium and gamma spectroscopy.

2.4.4 Scale of Decision Making

Decisions relative to whether surface RIM is present will be based on surveys performed with portable instrumentation in accessible areas as compared to known background levels of radiation. Decisions relative to whether the cover has adequately encompassed surface RIM will be based on surface gamma survey data and, the results of quick TAT samples analyzed for thorium-230.

2.4.5 Constraints on Decision Making

Adverse weather conditions could impact all aspects of the project.

2.5 STEP 5: DEVELOP A DECISION RULE

In Step 5, a decision rule is developed that defines the conditions that would cause the decision-maker to choose among alternative actions. Activities include: specifying the statistical parameter

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that characterizes the population; specifying an action level for the decision; confirming that detection limits will allow reliable comparison with the action level; and stating the decision rule.

2.5.1 Characterized Parameter

There are two primary parameters of interest. One is the portable instrument response to surface gamma emitting RIM that is considered statistically different from background levels of NORM. The other parameter is the concentration of thorium-230 that would cause extension of NCC material beyond that indicated by the response of portable instrumentation. These populations will be characterized by instrument response to identified surface RIM and the concentration of thorium-230 in soil samples collected around the perimeter of the identified surface RIM.

2.5.2 Action Level

Action levels will be established based on known background levels for this area and historic definitions of RIM as applied to this site.

2.5.3 Detection Limits

The reporting limits for critical parameters will be lower than the action levels unless technically not feasible considering routine analytical techniques.

2.5.4 Decision Rules

- If the response of portable radiation detection instrumentation greater that two times median background as established from response to NORM in a non-impacted area, the area will be targeted for NCC.

- If the concentration of the combined radium isotopes and/or combined thorium isotopes is greater than 7.9 pCi/g the sampling perimeter will be widened until the concentrations of the perimeter surface soil samples are not greater than 7.9 pCi/g for either combined radium or combined thorium (EMSI 2011). It is anticipated that the surface soil sampling will be performed approximately 10 feet outside the perimeter of the defined surface RIM to verify that hard-to-detect radionuclides are not present. It is anticipated that soil samples will be collected from locations spaced approximately 100 feet apart along the perimeter of the outer boundary of the extent of surface RIM/outer edge of the NCC except where the outer edge of the surface RIM coincides with the edges of the Area 1 or Area 2 waste disposal unit boundaries.

- If the concentration of NORM in the impacted area flora is significantly different from the flora from the non-impacted area, additional evaluations will be performed in conjunction with the EPA to determine if any additional actions are needed to address the remaining vegetation.

2.6 STEP 6: SPECIFY LIMITS ON DECISION ERRORS

Measurement errors for portable instrumentation will be minimized by performing quality control checks of instrument response prior to and after use.

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Measurement error for analytical data will be minimized by replicate analysis of the same sample. Measurement errors will be assessed by reviewing precision, accuracy, representativeness, completeness, and comparability as discussed in Section 4.0.

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3. SOIL SAMPLING PROGRAM

This section summarizes procedures for collecting soil samples in and performing radiological surveys of Areas 1 and 2 in OU1.

The site-specific HASP should be consulted to determine health and safety protocols for soil collection and survey activities. Feezor's site safety coordinator (Jonathan Wilkinson) will oversee and field activities and has day-to-day responsibility for implementing the HASP. Mr. Wilkinson has the appropriate level of training, familiarity with this site, and advanced level of field work experience to be familiar with health and safety requirements specific to the project. All contract employees working on the Surface RIM Cover project are expected to fully participate in implementing the site HASP by obtaining necessary training, attending site safety meetings, always wearing designated PPE, complying with site safety and health rules, and advising supervisors of health and safety concerns at the site.

All survey and sampling activities will be performed in accordance with this SAP. Survey and Sampling procedures are detailed in Auxier & Associates Standard Operating Procedures (see Appendix A).

3.1 SOIL SAMPLE COLLECTION

The following sections provide a general summary of the procedures for collection of soil in the AOCs. The purpose of this study is to collect samples at the perimeter of the cover as may be necessary to verify that the surface RIM is adequately covered.

3.2 PRE-SAMPLING ACTIVITYIES

The A&A health physics site lead will perform an inventory of necessary equipment and supplies before beginning and obtain any additional required equipment or supplies if necessary. The following equipment is required for sampling:

- Field logbooks
- Indelible ink pens
- Sample paperwork and sample tags and labels
- Custody seals
- Plastic zip-lock bags
- Shovels and trowels
- Personal protective equipment (PPE) if required by site-specific HASP
- Location-specific site diagrams
- Standard hand tools (screwdrivers, hammer, wrenches, etc.)

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3.2.1 Equipment Testing, Inspection, and Maintenance Requirements

All equipment will be inspected upon arrival to the site to ensure it is in proper working order. Any equipment that is found to be deficient will be removed from the site and replaced with another piece of equipment. Working around heavy equipment can be dangerous because of the size and power of the equipment, the limited operatory field of vision, and the noise levels that can be produced by the equipment. The following practices shall be followed by operators when using heavy equipment:

- Equipment should be inspected daily by the operator to ensure that the equipment is in safe operating condition. The inspection will be documented on a daily equipment check list.
- When not in use, hydraulic and pneumatic components should be left in down or "dead" position.
- Roll-over protection shall be provided on uneven terrain sites.
- No riding on vehicles or equipment except in fixed seats.
- Seat belts should be worn at all times.
- Backup alarms, automatically activated and loud enough to be heard above background noise, are required to be operational on all heavy equipment.
- Parking brakes should always be applied on parked equipment.
- Equipment should never be operated closer than 10 feet from utility lines.
- Windshields must be maintained, clean, and free of visual obstructions.

In addition, periodically and as required by Bridgeton requirements and any and all manufacturing requirements, all equipment should be kept to a strict maintenance schedule of upkeep and repair.

3.2.2 Instrument Calibration and Frequency

All portable instrumentation to be used for quantitative measurements are source calibrated a minimum of every twelve months. No other soil sampling equipment calibration is required. The hand-held GPS unit will be maintained in accordance with the manufacturer's recommendations but does not require calibration.

3.2.3 Inspection/Acceptance Requirements for Supplies and Consumables

Only equipment, supplies, and consumables with acceptable quality characteristics and from qualified vendors will be accepted for this project. Receipt and initial verification of all materials and equipment received, either purchased or contract (client) supplied, is the responsibility of designated A&A personnel.

3.3 SELECTION OF PERIMETER COVER LOCATION]

The number of samples required will depend upon the number of individual covered areas, and the size of individual covers. It is anticipated that soil samples will be collected from locations spaced approximately 100 feet apart along the perimeter of the outer boundary of the extent of surface RIM/outer edge of the NCC except for those areas where the outer edge of the surface RIM coincides with the edges of the Area 1 or Area 2 waste disposal unit boundaries.

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3.4 COLLECTION OF SOIL SAMPLES

At each sample location, samples will be collected using a trowel, or shovel to expose the soil to approximately 6 inches deep. Prior to sample collection, loose organic debris (e.g., roots, leaves, pine needles, duff) should be manually removed. Approximately 1 pound (lb) of soil should be collected for each sample. Soil samples should be collected in accord with A&A Procedure 4.3, Soil Sampling, Revision 3. In addition to the procedural requirements, the field team should note the soil's appearance (e.g., color, grain size).

Samples will be handled carefully to prevent cross-contamination and will be placed in appropriately labeled containers.

It is anticipated that soil samples will be collected from locations spaced approximately 100 feet apart along the perimeter of the outer boundary of the extent of surface RIM/outer edge of the NCC except for those areas where the outer edge of the surface RIM coincides with the edges of the Area `1 or Area 2 waste disposal unit boundaries.

3.5 COLLECTION OF LABORATORY QA SAMPLES

One field duplicate sample out of every twenty samples collected will be split and sent to the laboratory for analysis. Approximately 2 lbs of sample will be collected and placed in a sealing plastic bag. The soil will be mixed by crushing the soil in the bag and vigorously mixing. The soil will be split into two samples and will be labeled according to the instructions in Section 3.6 and with the designation of DUP at the end of the sample name.

3.6 SAMPLE LABELING AND DOCUMENTATION

Each sample will be placed in a sealing plastic bag and the bag will be completely sealed. The outside of the bag will be marked with a unique identification number and dated.

The identifiers expected for this sampling campaign are listed below:

- Project code: ENGCOV
- Area label: A1, A2 or RA
- Sample number: 001, 002, etc.
- Sample Matrix: S
- Sample Depth: This will consist of start and stop sample depths in centimeters with a dash between the two depths, such as 00-06 (0-6 in).
- The designation of DUP if the sample is a field duplicate sample.

For example, the third soil sample collected in Area 1 (A1) would be labeled:

ENGCOVA1003S00-06

The bags will be stored in a secure location in a manner that maintains chain-of-custody requirements until such time as they are ready for shipment. Samples will be double bagged, logged on a chain of custody form, and placed in a cooler or a similar strong-tight container. The chain of custody form for that shipment will be placed in the cooler until the cooler is shipped. Prior to sealing the cooler, the cooler will be surveyed with a Model 19 exposure rate instrument or

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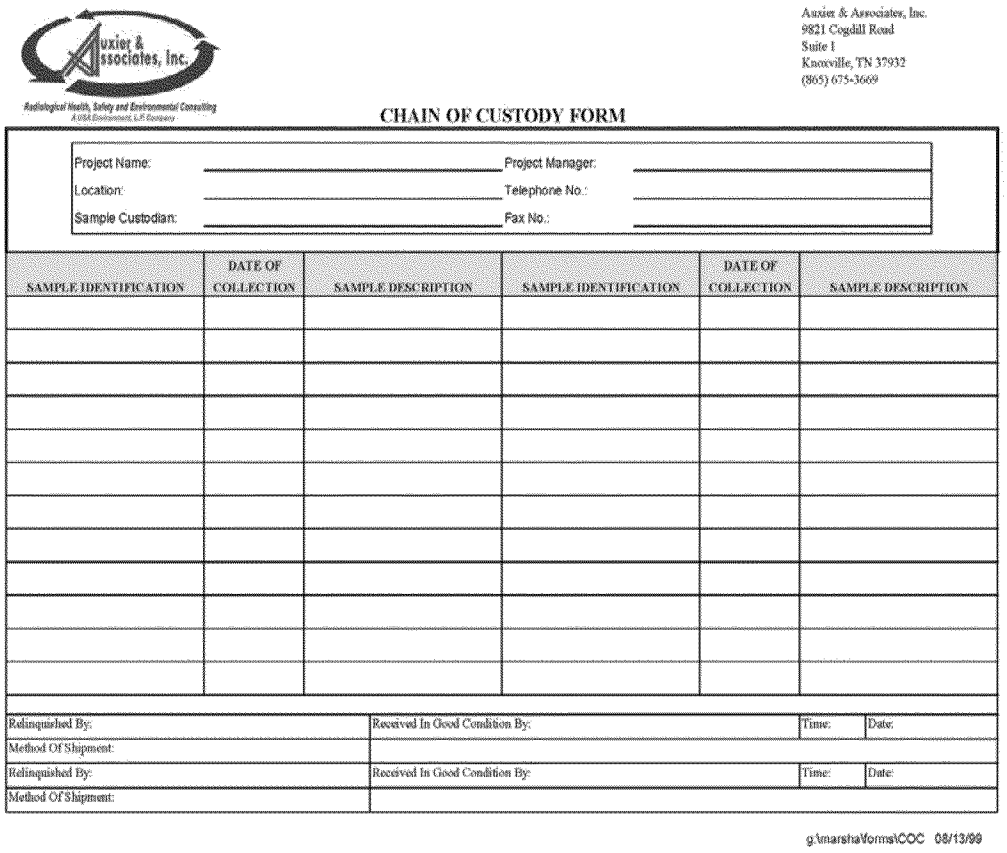
equivalent and the maximum reading will be recorded on the chain of custody form. The original chain of custody will be placed in the cooler and a copy retained at the Site. The cooler will be completely and securely sealed prior to shipment. (See A&A Procedures 4.0 "Environmental Sample Identification" and 4.1 "Sample Chain of Custody") (See COC Figure 2)



Auxier & Associates, Inc.
9821 Cogdill Road
Suite 1
Knoxville, TN 37932
(865) 675-3609

Auxier & Associates, Inc.
Radiological Health, Safety and Environmental Consulting
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CHAIN OF CUSTODY FORM

Project Name: _____ Project Manager: _____
Location: _____ Telephone No.: _____
Sample Custodian: _____ Fax No.: _____

SAMPLE IDENTIFICATION	DATE OF COLLECTION	SAMPLE DESCRIPTION	SAMPLE IDENTIFICATION	DATE OF COLLECTION	SAMPLE DESCRIPTION

Relinquished By:	Received In Good Condition By:	Time:	Date:
Method Of Shipment:			
Relinquished By:	Received In Good Condition By:	Time:	Date:
Method Of Shipment:			

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Figure 2: Sample Chain of Custody

3.6.1 Field Quality Control

3.6.1.1 Record Keeping

Each sample is tracked from the time of collection by extensive paper work which is completed during sampling and includes the following, as appropriate: 1) field documentation, 2) sampling field data sheet, 3) chain of custody, and 4) sample labels.

Original copies of field records and analytical data will be placed in the project file and retained for ten years following completion of the work. These records will be initially maintained by Auxier & Associates, Inc. but may be transferred to the client for long-term storage.

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3.6.1.2 Field Activity Logbook

Field logbooks must be bound and should have numbered pages. All pertinent information regarding the site and sampling procedures must be documented. Notations should be made in logbook fashion, noting the time and date of all entries. Recorded information would include, but not be limited to the following:

- Name and exact location of site of investigation
- Date and time of arrival and departure
- Name of person keeping log
- Field instrument calibration information
- Location of sampling points (including justification)
- Geographically-referenced location of sample point and how determined
- Number of samples taken, volume of samples taken
- Preservation
- Method of sample collection and any factors that may affect its quality
- Date and time of sample collection and any factors that may affect its quality
- Name of collector
- All sample identification numbers
- Description of samples
- Weather conditions on the day of sampling and any field observations.

Because sampling situations vary widely, field notes will be as descriptive and inclusive as possible; anyone reading the entries should be able to reconstruct the sampling situation from the recorded information. Language within field notes will be objective, factual, and free of inappropriate or ambiguous terminology. All field personnel are required to date and sign any data entries. All field documentation will be retained.

3.6.2 GPS Point Location

A Tremble GPS unit will be used to record the latitude and longitude at the center of each soil sampling location. The GPS location coordinates will be recorded in the field logbook and on the soil collection forms, and will be associated with the unique identification number for the background sampling location.

3.6.3 Equipment Decontamination

Trowels and containers will be used for soil sampling and may need to be decontaminated. If a small metal shovel is required to assist with sampling to 6 inches in hard, compacted soils, the shovel will be thoroughly cleaned and decontaminated, if necessary. Decontamination will occur at the location where the sample was collected and will include at a minimum surveying the equipment and wiping with Masslinn cloths (oil impregnated cloths commonly used for radiological decontamination) if necessary. If water is necessary to decontaminate an item, a spray bottle of water will be used. The water will be allowed to fall on the ground in the area just sampled and the Masslinn cloths will be placed in a labeled waste bag. Personal protective equipment will be worn according to HASP policies. Materials used in the decontamination process will be disposed of as investigation derived waste (IDW), and will be handled according to policies in the HASP and Radiation Safety Plan (RSP).

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3.6.4 Sample Processing

All soil samples will be sent to Eberline Services in Oak Ridge, Tennessee, for analyses of radionuclides (see Appendix B: Eberline Services Quality Assurance Manual). All samples will be packaged and shipped to the laboratory in accordance with USDOT regulations. Samples used to confirm that the perimeter of the cover encompasses both easy and hard to detect radionuclides will be submitted for quick turn analysis of isotopic thorium.

Upon receipt, the coolers will be opened and the samples checked against the chain-of-custody form. All samples will be weighed prior to drying. After samples are dry, the samples will be reweighed and then ground to promote homogeneity.

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4. ANALYTICAL DATA QUALITY OBJECTIVES

The primary goal of this Plan is to ensure that survey data combined with soil sample results (if any) result in adequate coverage of surface RIM. Data must be of known and acceptable quality, and must have sufficient sensitivity to confidently detect target parameters at or below action levels, as determined from the survey data and, if necessary, soil sample results from the reference area.

Data quality objectives (DQOs) for analytical data are defined in terms of precision, accuracy, representativeness, completeness, and comparability of the data. Quantification and detection limit, bias, precision, completeness, and holding time DQOs are presented in Table 1 . This will ensure that the data collected are sufficient and of adequate quality for their intended uses. Data that do not meet DQOs will be qualified during data validation, and their limitations will be noted (where possible given the time constraints). Adequate quantities of sample will be collected to ensure that all necessary analyses can be conducted (e.g., field duplicate analysis and laboratory QC analyses), to meet minimum detectable activity goals, and where possible, to provide archived samples for possible future reanalysis or as replacements for the possible loss of original samples.

DQOs for precision in Table 1 and shown in Appendix C: Laboratory Specifications are based on EPA or equivalent method QC acceptance criteria. Detection limits identified in the Laboratory Specifications are based on feasible analytical methods and detection limit requirements.

Analyses will be performed using approved analytical techniques by qualified individuals using industry standard methods such as EML U-02 (isotopic uranium), EML Th-01(isotopic thorium) and LANL ER-130 (gamma spectroscopy). The laboratory must also successfully participate in annual performance testing such as that conducted by Environmental Resource Agency (ERA) or the Department of Energy (i.e. the Mixed Analyte Performance Evaluation Program or MAPEP). A summary of auditable aspects of the sampling QA/QC approach is provided in Table 1.

Table 1 -Analytical Methods/Quality Assurance Table

Parameter	Value
Matrix type	Soil
Number of samples to be collected	TBD
Number of samples to be analyzed	TBD
Number of field, equipment and trip blanks	NA
Analyte (Radionuclide of Interest)	Isotopic uranium, and thorium, and radium
Analytical methods	100% Alpha spec for isotopic uranium and thorium 100% Gamma spec with 21-day ingrowth

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	period for radium isotopes and other unspecified gamma emitters.
Number and type of matrix spikes (MS)	NA
Number and type of duplicate samples	5% for soil
Number and type of split samples	Number and type not currently known. Samples may be split as requested by other parties.

4.1.1 Sample Analysis

Alpha and Gamma spectroscopy will be performed on all samples sent to Eberline Services in Oak Ridge, TN. Isotopic thorium and isotopic uranium will be determined using alpha spectroscopy. The target analytes of the gamma spectroscopy will be radium isotopes, Bi-214, Pb-214, and Pa-231; but a full report on all gamma emitters will be requested.

4.1.1.1 Laboratory Quality Control

The quality of the laboratory data is assessed by precision, accuracy, representativeness, completeness, and comparability (the "PARCC" parameters), and detection limits. Definitions of these parameters and the applicable quality control procedures are described below. The Laboratory Quality Assurance Program Manual is included in appendix B and is incorporated by reference.

4.1.1.1.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability (precision) of two or more measurements compared to their average values. Precision is calculated from results of duplicate sample analyses. The duplicate samples will consist of one or more of the following: co-located samples, field replicates, analytical laboratory replicate, and/or laboratory instrument replicate. Laboratory replicate samples will be analyzed at a minimum frequency of one per twenty samples (five percent) per matrix analyzed. Laboratory replicate precision for radionuclides is quantitatively expressed as the absolute or relative percent difference (RPD). These measures are then compared to control limits based on the required or relative method uncertainties.

The variability in the sampling technique will be evaluated by analyzing 1 field duplicate per 20 sample collected. These duplicate samples will be used to qualitatively assess the precision of the sampling mechanism, but will not be used to qualify or reject data.

4.1.1.1.2 Accuracy

Accuracy is a measure of the closeness (bias) of the measured value to the true value. The accuracy of laboratory test results can be assessed by analyzing a reference material, third-party performance evaluation samples, or "spiking" samples in the laboratory with known standards (surrogates or matrix spikes) and determining the percent recovery.

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Laboratory control samples (spikes) for radiological analyses will be carried out in accordance with SW846 requirements for organic analyses (EPA, 1986) at a minimum frequency of one in 20 samples (five percent) per matrix analyzed.

The accuracy of sample results can also be affected by sample contamination. Sample contamination can occur because of improperly cleaned sampling equipment, or because of high radiation levels in the laboratory. To ascertain that the samples are not contaminated by laboratory activities, blank samples will be analyzed at a minimum frequency of one in 20 samples (five percent) per matrix analyzed.

4.1.1.1.3 Representativeness

Representativeness is a qualitative measure of how closely the measured results reflect the actual concentration or distribution of the constituent concentrations in the matrix sampled. The sampling plan design, sampling collection techniques, sample handling protocols, sample analysis methods, and data review procedures have been developed to assure the results obtained are representative of on-site conditions.

4.1.1.1.4 Completeness

Completeness is defined as the percentage of measurements judged to be valid. Results will be considered valid if they are not rejected during data validation. The target completeness goal for this work will be 90 percent.

4.1.1.1.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The use of standard methods and procedures for both sample collection and laboratory analysis ensure comparability of data.

4.1.1.1.6 Detection Limits

The laboratory will be requested to provide full documentation of the analysis performed which will include detection limits for the procedure followed. These documents will be reviewed for completeness and maintained in the project files.

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4.2 CERTIFICATION AND SPECIAL TRAINING

Certification in the State of Missouri and/or NELAP for the radioanalytical laboratory is required.

The H&S representative is responsible for assuring that the project team and any subcontractors have the appropriate training and certifications.

4.3 DOCUMENTS AND RECORDS

A summary report will be submitted to EPA Region 7 at the end of the project and will include all sampling and analytical results. A map will be provided showing sample locations; survey maps generated from portable survey results married with GPS location data, field and analytical data tables, and data validation summaries. The most current version of this SAP will be maintained by the Health Physics Project Manager and distributed according to the distribution list. Revisions to the SAP may be identified by the date appearing in the footer of this document. Bound notebooks or electronic field sampling forms are utilized by field personnel for entering field data. Records and documentation procedures are discussed in detail in the SOPs. Analytical laboratory documentation, case narratives and all supporting documentation for a Level IV package deliverable will be provided in the laboratory data package.

Original field notebooks, chain-of-custody (COC) records, field data sheets, disks, tapes, and lab reports will be filed and stored at A&A's offices in Knoxville, TN.

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5. DATA GENERATION AND ACQUISITION

5.1 NON-DIRECT MEASUREMENTS

Acquisition of non-direct data is not anticipated for this project.

5.2 ASSESSMENTS AND OVERSIGHT

Assessments and oversight over both laboratory and field activities ensure that this SAP is implemented as intended and that field activities are on track. Finding critical problems towards the end of a project is minimized by implementing proper assessment and oversight.

5.2.1 Readiness Review

A readiness review assesses field team preparations prior to starting field activities. The PM is responsible for reviewing all field equipment, instruments, and paperwork in advance of all site-related activities. Site work cannot commence until all issues are resolved to the PM's satisfaction. Before the site-related work begins, a readiness review will be conducted. At that time all field personnel will be given a review of the objectives, procedures, and equipment that will be used during the project.

5.2.2 Field Assessments and Surveillances

The PM will be responsible for periodic field assessments during the duration of the site work. These assessments would take place, at least, quarterly. During these assessments the PM would review paperwork, observe performance of field personnel, and ensure that all operations are being conducted in a manner that is consistent with this SAP.

5.2.3 Corrective Action Procedures

Corrective actions are developed on a case-by-case basis and are initiated whenever control limits are exceeded, or when results of other system audits or inter-laboratory results indicate an analysis is outside of control limits. Corrective action is taken to determine the cause, and a decision is made on the acceptability of the data collected for that lot of samples. The Laboratory Quality Assurance Program Manual is included in Appendices B.

Situations that may result in corrective action in the analytical laboratory or the field laboratory when include:

- Hold times are exceeded;
- A blank has exceeded the limit of quantitation;
- An instrument has failed a calibration check;
- A performance or check sample result is outside control limits; and
- A laboratory control sample result has exceeded the control limits.

5.2.4 Data Management

The laboratory will supply Level IV CLP-like data reports with all analytical results to A&A and EMSI. The laboratory will also supply analytical results in electronic spreadsheet format to the A&A Project Manager and EMSI.

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5.2.5 Disposition of Records

As mentioned in Section 3.6.1.1, records will be kept on file for ten years after project completion. After that time, they may be transferred to the client for long-term storage or disposed of through a method of the client's choosing and expense.

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6. DATA VALIDATION AND USABILITY

6.1 DATA VERIFICATION, VALIDATION, QUALITY ASSESSMENT, AND DELIVERY

The primary goal of data verification and validation (V&V) is to ensure that decisions are supported by data of the type and quality needed and expected for the intended use. Data verification is the process of evaluating the completeness, correctness, and consistency of a laboratory package or final data to assure that laboratory conditions and operations are compliant with project plan documents. Data validation addresses the reliability of the data. Results are evaluated to determine the presence or absence of an analyte and the uncertainty of the measurement process for contaminants of concern. Finally, scientific and statistical evaluation of the data may be required to determine if the quality of the data can support its intended use (MARLAP 2004). V&V and summary reports will be generated and submitted to EMSI. The A&A Project Manager will coordinate with EMSI to determine the formats and schedules desired for transmittal of the laboratory results, validation and summary reports.

The data validator for EMSI, Lynn Brill, will review all radiological data for completeness and accuracy and to determine if the project QA/QC goals have been achieved. Field operations will be fully documented, reviewed, and audited on an annual basis at a minimum by the Auxier and Associates Quality Assurance Officer, Marsha Joseph or the Project Manager, Cecilia Greene. Findings and observations will be reported to Paul Rocasco (the designated project coordinator for the Respondents under the UAO), and Mike Bollenbacher (site Radiation Safety Officer) for assessment and corrective action, if applicable. The quality of field and laboratory data will be evaluated based on precision, accuracy, representativeness, completeness, and comparability of the data generated by each type of analysis.

The validator will review all laboratory submittals to verify that the data package is complete, including checks to verify:

- Sample numbers and analyses match the Chain of Custody;
- All analyses requested were performed;
- Package contains Chain of Custody;
- Laboratory applied data qualifiers (if applicable);
- Case narrative identifies problems (if applicable), including explanation of data qualifiers;
- Sample hold times are met;
- Instrument performance checks have been performed and are acceptable;
- QA/QC samples are present at proper frequency;
- Reports for QA/QC samples; and
- Describe in detail any off-normal conditions or difficulties.

The completeness, correctness, and conformance/compliance of the data will be verified and validated against the method, procedural, and contractual requirements. Guidance for data verification/validation is provided in the Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP) for radiological constituents. Qualifiers will be applied to the analytical data according to the guidance contained in these documents. One hundred percent of

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the laboratory data will be verified and validated. Reports must be reviewed and approved by the Project CHP prior to transmission to a regulatory agency or inclusion in draft reports.

6.2 CORRECTIVE ACTIONS

Corrective actions are developed on a case-by-case basis and are initiated whenever control limits are exceeded, or when results of other system audits or inter-laboratory results indicate an analysis is outside of control limits. Corrective action is taken to determine the cause, and a decision is made on the acceptability of the data collected for that lot of samples. Laboratory Quality Assurance Program Manuals are included in Appendices B and C.

Situations that may result in corrective action in the analytical laboratory or the field laboratory include:

- Hold times are exceeded;
- A blank has exceeded the limit of quantitation;
- An instrument has failed a calibration check;
- A performance or check sample result is outside control limits; and
- A laboratory control sample result has exceeded the control limits.

6.3 COMPLETION OF REVIEW

Once all data within the data set are determined to be acceptable, the Project CHP will approve the data set. If not, the Project CHP will determine what further action is necessary. Further action could include re-sampling, reanalyzing archived samples, or eliminating the questionable data from consideration.

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7. REFERENCES

EMSI 2016	Work Plan for Installation of a Non-Combustible Cover over Radiologically-Impacted Material At or Near the Ground Surface in Radiological Areas 1 and 2, West Lake Landfill Operable Unit-1, December 2015.
EMSI 2011	Supplemental Feasibility Study, West Lake Landfill OU-1, December 2011.
USEPA 2015	Unilateral Administrative Order for Removal Action EPA Docket No. CERCLA-07-2016-0002, December 2015.
USEPA 2001	Guidance for Quality Assurance Project Plans, EPA QA/G-5, December 2002.

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Appendix A

Auxier & Associates Operating Procedures

PROCEDURE 3.0
CALCULATING INSTRUMENT SENSITIVITY

1.0 PURPOSE

1.1 To describe the method for calculating detection sensitivities applied to field survey activities.

2.0 RESPONSIBILITY

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team personnel are responsible for following this procedure.

3.0 PROCEDURE

3.1 The detection sensitivity of a measurement system refers to the statistically determined quantity of radioactive material or radiation that can be measured or detected at a preselected confidence level. This limit is a factor of both the instrumentation and the technique or procedure being used. Several terms that are used to define detection sensitivity are:

- Minimum Detectable Activity (MDA)
- Critical Level
- Measurable Activity Level

Minimum Detectable Activity (MDA) is an a priori estimate of the detection capability of a sampling and/or measurement technique, based on nominal or expected performance characteristics of the instrumentation. This concept is used to develop initial estimates of measurement capabilities, when planning survey strategies and selecting instruments and techniques for specific applications. In estimating the MDA, it is assumed that there is a background level greater than zero, which will also be subject to structural variability. Two types of errors are considered in performing this estimate:

Type I error (or "false positive") occurs when a detector response is considered to be above-background when in fact, above-background radiation is not present.

Type II error (or "false negative") occurs when a detector response is considered to be background when in fact above-background is present. If 5% false positives (Type I) and 5% false negatives (Type II) are selected to be acceptable levels for both types of errors, and it is assumed that the background and sample counting times are the same and the background level is not well known (a situation commonly encountered when conducting field survey activities), the MDA is calculated using the following relationship

$$= \frac{2.75 + 4.65\sqrt{B_R t_m}}{E \cdot t_m \cdot C}$$

where:

B_R = background rate in counts in minutes

t_m = counting time in minutes

E = detector efficiency in counts/ disintegrations

C = other constants and factors to convert calculated level to units for comparison with guideline. For example, to calculate the MDA (in dpm/ 100cm2) for direct surface activity area of A cm2, the value of C would be (A/100).

Because both types of possible errors are considered in this calculation, the MDA estimate will yield a larger value than can be realistically achieved by field surveys and therefore provides a conservative approach for planning. For some applications, the MDA estimate may result in such conservatively high values that use of certain instruments or techniques may be unnecessarily negated for a given measurement. Therefore, while use of the MDA for planning purposes may be the conservative approach, for practical purposes use of a less conservative, although technically justified, approach is acceptable. The objective of field surveys is primarily to identify conditions exceeding established guidelines while avoiding "false negative" results; positive findings will typically receive further evaluation and therefore "false positive" findings will not be a factor in final survey data evaluation. The concept of critical level (LC) is useful under these circumstances. The critical level is the lower bound (in net counts), below which there is less than a 5% probability that the measurement represents an above-background condition (i.e. is a "false negative" result).

This term is calculated by:

$$= 2.32\sqrt{B_R t_m}$$

This value should be used when actually counting samples or making direct radiation measurements. Any net response above this level should be considered a positive result.

PROCEDURE 3.1
BACKGROUND MEASUREMENTS

1.0 PURPOSE

1.1 To describe the considerations for performing measurements of background direct radiation levels and for collecting samples of media to analyze for background radionuclide concentrations.

2.0 RESPONSIBILITY

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 The Project Manager or his/her designee is responsible for selecting locations for background determinations.

2.3 Survey team personnel are responsible for following this procedure while collecting background samples and measuring background radiation levels.

3.0 PROCEDURE

3.1 Guidelines for residual radioactivity are expressed in terms of radiation or activity levels above ambient background for a specific site of interest. It is therefore necessary to establish background levels in order to eventually determine net residual radiation levels or concentrations for comparison with guidelines.

Background, as related to radiological survey operations, is of two general categories. One of these is the concentration of radioactive material, naturally occurring in environmental media (air, soil, water, vegetation) and incorporated into construction materials. Examples of such radionuclides are carbon-14, potassium-40, uranium and thorium and their associated daughter products, and cesium-137 from worldwide fallout. The second category of background radiation is the direct radiation level, produced by the materials from the first category, plus the direct radiation from extraterrestrial sources

Concentrations of naturally- occurring radioactive materials vary, as do direct radiation levels from those materials and cosmic sources. Background radiation will therefore be a distribution of values, rather than a single value. The range may vary from location to location on a particular site; the degree of variation may be small or significant enough that more than one background value must be determined for application at the site.

3.2 Locations for Background Measurements and Samples

3.2.1 Outdoor

3.2.1.1 Locations for measurement and sampling are selected within an area having a surface geology that is similar to the survey site and within a 10 kilometer radius of that site.

3.2.1.2 Locations should be undisturbed by radioactivity from the candidate site or other anthropogenic sources (e.g., fertilizers

containing elevated concentrations of uranium and potassium and building materials with high natural levels of uranium and thorium).

3.2.1.3 If the radionuclides of interest are from the naturally occurring series, efforts should be made to obtain background concentrations from geologic formations similar to that at the site.

3.2.1.4 The physical coordinates of all background locations should be described and recorded in a way that allows the site to be located at a later date. Acceptable methods include recording the coordinates from a land-survey of the location; GPS coordinates with sub-meter precision; and measured offsets from known, identifiable locations.

3.2.2 Indoor

3.2.2.1 Locations should not be potentially impacted by contamination, but may include influences determined to be naturally occurring in building materials. Preferable locations are within on-site buildings of similar construction, but having no history of radioactive materials operations.

3.3 Background Measurements

3.3.1 Measure the external gamma flux at 6 inches and at 1 meter above the ground surface using the instruments that will be used to perform the survey (see Procedure 2.4). An exposure rate measuring instrument may also be used to measure the exposure rate at those locations

3.3.2 If appropriate for the specific site, measure the alpha dpm/100 cm^2 and the beta dpm/100 cm^2 (see Procedure 2.3).

3.4 Background Sampling

3.4.1 When background concentrations of radioactive materials are desired, collect media samples from the same locations used to measure the background radiation in Section 3.3 of this procedure. Sampling techniques are described in Procedures 3.2, 3.3, 3.4, 3.5, 3.6, and 3.9 for sampling procedures for various types of media.

3.4.2 When potential contamination of water is of concern to the survey objectives, a water sample should be collected from surface sources upstream from the site of concern. Water sampling procedures are described in Procedure 3.5. Sediment samples may also be collected at locations where surface water is obtained (see Procedure 3.2).

3.4.3 Collect samples of other environmental media (e.g., air and vegetation) that are appropriate based on the types of samples to be collected on-site.

3.4.4 Collect samples of building materials, if necessary, to determine the extent of naturally occurring radioactivity present.

3.5 Number of Background Measurements/Samples

3.5.1 The degree to which the average background of a particular radiological parameter (concentration or direct radiation level), determined for a specific site, is representative of the true background value is a factor in determining the number of measurements required for that determination. Many radionuclides are not present in the environment at levels that are sufficient to be either quantifiable using reasonable, standard measurement techniques or which are significant, relative to guidelines for unrestricted site use. On the other hand, levels of direct radiation (exposure rates) and some naturally occurring (uranium and thorium decay series) or manmade (cesium-137) radionuclides are typically present in the environment at levels which are easily quantifiable and may have background levels which are significant, relative to guideline values.

The number of background measurements and samples collected will be project-specific. Depending on the objectives of the survey, the number may vary from a minimum of one (1) to as many as determined by the project manager.

If the PM anticipates that the selection of appropriate background values will be a critical factor in the evaluation and interpretation of the survey findings, determining project specific background needs should be addressed during the survey design. For example, large variations in background levels within a site may require that the site be subdivided and separate backgrounds determined for the individual portions. Guidance on identifying additional background data needs is available from several sources (e.g., draft NUREG/CR-5849, MARSSIM, and NUREG-1501).

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PROCEDURE 2.3
GAMMA RADIATION (EXPOSURE RATE) MEASUREMENT

1.0 PURPOSE

1.1 To describe the method for measuring external gamma radiation levels in buildings and over ground surfaces.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

3.1 Equipment and materials

3.1.1 Micro R Meter: Model 19, Ludlum Measurements, Inc.; Micro Rem Meter, Harshaw Bicron Radiation Measurement Products, or equivalent

3.1.2 Check sources

3.1.3 Record forms

3.2 Quality Control Check

3.2.1 Assemble instrument, turn on, check batteries, and allow to stabilize approximately 10 minutes. Check background level and response to the gamma check source.

3.2.2 Follow procedures described in Procedure 1.1.

3.2.3 An action level may be established by the SSM, based on the exposure rate guidelines that have been established for the site. For a particular site the action level may be established as any activity exceeding background. A field measurement at or above this value indicates that further investigation at this location is necessary.

3.3 Measurements

3.3.1 Place the detector at the position where the measurement is desired, usually at 1 meter and at 6" above the surface.

3.3.2 Allow the meter to stabilize and observe the meter response; if necessary, switch the range selector to obtain the maximum fraction of full-scale meter deflection possible.

3.3.3 Record the average response rate on the appropriate record form.

PROCEDURE 4.0
ENVIRONMENTAL SAMPLE IDENTIFICATION

1.0 PURPOSE

1.1 To assure consistent sample identification.

2.0 RESPONSIBILITIES

2.1 The Corporate Secretary (or designated agent) is responsible for maintaining a list of site identification codes that have been used in the past or are in current use.

2.2 The Project Manager is responsible for selecting site identification code(s) appropriate for new site(s) and assuring that the site identification codes are unique.

2.3 The Site Survey Manager is responsible for selecting grid identification numbers, and developing a system for relating the grid identification numbers to an appropriate land survey convention.

2.4 The Site Survey Manger is responsible for assuring that this procedure is implemented.

2.5 Survey team personnel are responsible for following this procedure.

Note: The Site Survey Manager may modify any part of this identification system as needed in order to facilitate field work in a given situation, provided that no ambiguous sample numbers are produced in the process. The Site Survey Manager should keep departures from the standard format to a minimum, and is responsible for overseeing all consequent modifications to data handling/processing software and procedures that may be required by such modifications.

3.0 PROCEDURE

3.1 Field samples shall be identified by an alphanumeric code. This code shall be used on the sample container, on the chain-of-custody forms, and in the field records.

3.2 The general format of the code is typically: XXXXXXY123. Where:

3.2.1 XXXXXX= Four to six letter site identification code identified in Step 2.2, above.

3.2.2 Y= A one-digit code indicating the medium protocol.

A: Air
D: Sediment
R: Smears
S: Soil (including amorphous materials found in the soil, earthen or not)
V: Vegetation

W: Water
X: Misc. Not covered above

3.2.3 123= alphanumeric characters (usually 3) indicating the particular number of a particular sample type or general category for the site. Each number will correspond to a location designation on a map or grid area. Additional characters may be included to further identify location such as depth of sampling.

3.2.4 Examples of some sample codes are:

RFYCTGS143-the 143rd soil sample collected for project RFY/CTG

RFYCTGS187.090-a soil sample from the 90 cm depth at location 187 for the project RFYCTG

GIBONMW001-the first water sample collected for project GIB/ONM

3.3 At a minimum, sampling date, sampler initials and the sample identification are placed on the sample.

3.4 The identification method for the project should be described in the project records.

3.5 Marking is performed using an indelible pen.

3.6 All samples known or suspected of containing levels of radioactivity, which could present a contamination or exposure problem, are to be placed in clean outer containers and clearly marked with descriptive information, as appropriate, according to the sample screening requirements.

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PROCEDURE 4.1
SAMPLE CHAIN-OF-CUSTODY

1.0 PURPOSE

1.1 To provide a method for sample chain-of-custody.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 PROCEDURE

Chain-of-custody is initiated upon collection (or receipt) of samples and continues until samples are transferred to another organization or are disposed. An acceptable chain-of-custody is maintained when the sample is under direct surveillance by the assigned individual; the sample is maintained in a tamper-free container; or the sample is within a controlled-access facility. The chain-of-custody is recorded on a standardized A&A form (see Appendix A) or a form provided by another organization, such as an analytical laboratory or another sampling agency.

3.1 Field Procedures

3.1.1 An individual present during sample collection is designated as the sample custodian and is responsible for maintaining surveillance of the sample until the custody of that sample is transferred to another party. Samples must, at all times, be in the possession and under the direct surveillance of the sample custodian, or secured in a locked vehicle, building, or container. The sample custodian initiates a chain-of-custody form, daily, for all samples collected or received on that day.

3.1.2 Samples may be listed on the form as an individual entry or group of samples having common characteristics and originating from the same site may be recorded as a single entry, provided information describing each sample in the group (e.g. a completed field data form) is attached to or referenced on the custody form.

3.1.3 If sample custody is to be transferred (relinquished), the container and its contents are inspected by the individual accepting custody to assure that tampering has not occurred and custody has therefore been maintained. If evidence of tampering is observed or if any deviations or problems are noted, a notation must be provided on the form by the individual accepting custody. The sample collector must sign the first "Relinquished by" block and the receiver must complete the first "Received by" block.

3.1.4 If sample custody will not be assured under one of the conditions in item 3.0 above, a security seal is placed on the container of the samples. A security seal is a wire, tape, or other such item, which is uniquely

identified (numbered), and can be affixed to a package in a manner as to require damaging the seal if the package is opened. Damage to the seal thereby alerts the recipient of a package to the possibility of tampering with the contents. The number of the seal is entered onto the Chain-of-Custody form. Samples, which are under security seals, do not have to be maintained in a secure area; however, precautions should be taken to restrict sample access to authorized individuals.

3.1.5 The original of the chain-of-custody form must contain all signatures and other pertinent records regarding custody. Therefore the original is retained in the possession of the individual who has custody.

3.1.6 As long as samples remain in custody of the sampler, both copies of the chain-of-custody form are to accompany the samples. If custody is transferred to another individual and the control requirements in item 3.0 above are not satisfied, the duplicate copy of the form is packaged with the samples and the original remains with the individual having custody.

3.1.7 Samples collected by other organizations and provided to A&A personnel will have chain-of-custody initiated for them by the individual receiving the samples. When the organization has an established chain-of-custody in place, a copy of the form will be attached to the A&A form.

3.2 Sample Transport

3.2.1 Samples must comply with regulations of the Department of Transportation, if they are to be transported over or through publicly accessible transport routes. The Health and Safety Plan describes the procedure for assuring compliance with this requirement.

3.2.2 Unsealed samples may be transported by a vehicle controlled by the person having custody of the samples, or in that person's hand carried baggage.

3.2.3 Transport by mail, checked baggage, common carrier, or other mode not controlled by the sample custodian of record, requires that security seals be used.

3.2.4 The method of transport is to be identified on the original chain-of-custody record. If inner containers are sealed, additional seals on outer packaging are not required.

3.3 Samples sent to other organizations

3.3.1 The custodian will sign the "Relinquished by" space and the original form will be packed with the samples.

3.3.2 Receiving organizations will be requested to check the container and its contents for signs of tampering and note any deficiencies in the "Comments" portion of the form.

3.3.3 When samples will not be returned to A&A, the receiving organization will be asked to return the original of the form. The form will be provided to the Project Manager, for inclusion with the project records.

3.3.4 If samples will be returned to A& A, the receiving organization will be asked to sign the "Relinquished by" space and pack the form with the samples for return shipment. Upon receipt, the samples and form will be provided to the Project Manager, who will sign the "Received" space and place a copy in the project file.

PROCEDURE 4.3
SOIL SAMPLING

1.0 PURPOSE

1.1 To describe the procedures for collecting soil samples.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 EQUIPMENT

3.1 Digging implement: garden trowel, shovel, spoons, post hole digger, etc

3.2 Special sampling apparatus (cup cutter, shelby tube, metal or plastic tube, etc.) as required

3.3 Drilling equipment: drilling rig, portable motorized auger, manual auger

3.4 Subsurface sampling apparatus: split-spoon sampler, shelby tube sampler

3.5 Sample containers

3.6 Tape

3.7 Indelible pen

3.8 Labels and security seals

3.9 Equipment cleaning supplies, as appropriate

3.10 Record forms and/or logbook

4.0 PROCEDURE

4.1 NOTE: Typically, soil contamination criteria for radionuclides are applicable to the average concentration in 15 cm layers of soil, therefore, the sampling protocols described here are based on sampling 15 cm increments. The method used to sample soil will depend on the specific application and objective. Therefore, several techniques are described in this procedure and selection will be on a site-specific basis. Special situations (e.g., evaluating trends or airborne deposition, determining near-surface contamination profiles, and measuring non radiological contaminants, necessitate special sampling procedures. These special situations are evaluated and incorporated into site specific survey plans as the need arises.

4.2 Direct surface and 1 meter gamma radiation measurements may be performed at each location before initiating sampling. This will identify the presence of gross radionuclide contamination that will require special handling and equipment cleanup procedures. If contamination is suspected, a beta-gamma "open" and "closed" measurement may also be desired before sampling begins.

4.3 Surface Soil

4.3.1 Loosen the soil at the selected sampling location to a depth of 15 cm, using a trowel or other digging implement.

4.3.2 Remove large rocks, vegetation, and foreign objects (these items may also be collected as separate samples, if appropriate).

4.3.3 Place approximately 1 kg of this soil into the sample container. If it is not possible to reach a depth of 15 cm using a hand tool (i.e. trowel or shovel) 1 kilogram of soil should be collected from the accessible depth. The actual depth should be recorded on the sample container and the appropriate record form.

4.3.4 Seal the bag using a twist tie, cap, and tape the cap in place (or tie the sample bag strings).

4.3.5 Label and secure the sample container in accordance with Procedures 4.0 and 4.1. Record all pertinent information on the Chain-of-Custody Form.

4.3.6 Record sample identification, location, and other pertinent data on appropriate record forms, maps, drawings, and/or site logbook.

4.3.7 If the location has been identified as having elevated activity, a measurement should be obtained after the sample is collected to determine the possibility of contamination at a depth greater than 15 centimeters. If a subsurface sample is deemed necessary, refer to the appropriate section below.

4.3.8 Clean sampling tools, as necessary, according to the procedure in the Quality Assurance Plan, before proceeding with further sampling.

4.4 Subsurface Soil (Option 1)

4.4.1 This procedure is applicable to depths of approximately 3 m when boreholes or trenches have been dug and remain un-collapsed or do not contain water.

4.4.2 When direct radiation measurements are required (surface and borehole logging) they are to be performed prior to sample collection in order to identify the presence of gross radionuclide contamination requiring special handling or cleanup (see the Quality Assurance Plan and/or Health and Safety Plan). If borehole logging is to be done it should be completed before sampling begins (see Procedure 3.5).

4.4.3 Place a plastic bag liner into the downhole sampler and secure with a large rubber band.

4.4.4 Lower the sampling tool to the desired depth in the borehole or trench.

4.4.5 Scrape the inside borehole or trench wall with the toothed edge of the tool until approximately 1 kg of sample is collected.

4.4.6 Transfer the plastic bag and sample into the container.

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4.4.7 Seal the bag using a twist tie, cap, and tape the cap in place (or tie sample bag ties).

4.4.8 Label and secure the sample container in accordance with Procedures 4.0 and 4.1. Record all pertinent information on the Chain-of-Custody Form.

4.4.9 Record sample identification, location, depth, and other pertinent data on the appropriate record forms, map, drawing, and/or site logbook.

4.4.10 Clean sampling tools, as necessary, in accordance with instructions in the Quality Assurance Plan, before proceeding with further sample collection.

4.5 Fixed Geometry and Subsurface Soil (Option 2)

4.5.1 This procedure is appropriate for sampling at depths exceeding 3 m, in boreholes where walls do not remain intact or that fill with water and in situations where it is necessary to retain the orientation of the sample. An example where the latter may be the case, would be when it was necessary to analyze segmented aliquots to determine radionuclide concentrations as a function of depth. This approach could incorporate surface sampling as well as subsurface sampling.

4.5.2 If necessary, drill the borehole to the desired sampling depth using an auger.

4.5.3 Drive a split spoon, shelby tube, or similar design sample collector through the specified sampling depth.

4.5.4 Withdraw the collecting device; the collected core may be removed at this time.

4.5.5 If the collected core is removed, place the entire core, or a portion of the core, into a sample container. The core may be split into multiple segments, representing different sampling depths. If the core is to remain in the sampling device, the ends are sealed and the orientation noted.

4.5.6 Label and secure the sample container in accordance with Procedures 4.0 and 4.1. Record all pertinent information on the Chain of Custody Form.

4.5.7 Record sample identification, location, depth, and other pertinent data on the appropriate record forms, map, drawing, and/or site logbook.

4.5.8 Monitor the sample hole to determine activity level. If the activity level is elevated, it may be desirable to repeat items 4.5.1- 4.5.6. If the activity level has dropped to background, record the measurement and monitor the area, including personnel and equipment, to determine if decontamination that may be necessary.

4.5.9 Clean sampling tools, as necessary, in accordance with instructions in the Quality Assurance Plan, before proceeding with further sample collection.

PROCEDURE 4.4
VEGETATION SAMPLING

1.0 PURPOSE

1.1 To describe the method for collecting samples of vegetation.

2.0 RESPONSIBILITIES

2.1 The Site Survey Manager is responsible for assuring that this procedure is implemented.

2.2 Survey team members are responsible for following this procedure.

3.0 EQUIPMENT

3.1 Knife, shears, or similar cutting tool

3.2 Plastic bags

3.3 Burlap bags

3.4 Tape

3.5 Baggage tags

3.6 Labels and security seals

3.7 Indelible pen

3.8 Record forms

3.9 Cleaning supplies, as appropriate

4.0 PROCEDURE

4.1 Cut vegetation of desired type from selected location as close as possible to the surface. Attempt to avoid collecting soil.

4.2 Collect a total of approximately 1 kilogram of vegetation.

4.3 Place the sample in a plastic bag (if water is to be retained in the vegetation) or burlap bag (if vegetation is acceptable dry).

4.4 Secure the top of the bag with masking tape.

4.5 Attach a baggage tag.

4.6 Label and secure in accordance with Procedure 4.0 and the Chain of Custody Procedure 4.1. Record all information on the appropriate record form.

4.7 Record all pertinent information on the appropriate record form.

4.8 Clean collecting equipment, as appropriate, before proceeding with additional sampling (Quality Assurance Plan).

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Appendix B

Eberline Quality Assurance Manual

Eberline Analytical
Oak Ridge Laboratory
Quality Assurance Program Manual

AUTHORIZATION AND APPROVAL STATEMENT

This **Eberline Analytical** - Oak Ridge Laboratory,
Quality Assurance Program Manual
is authorized and approved in its entirety by:

Saba Arnold Seaver
Quality Assurance Manager

Date: August 1, 2013

Michael R. McDougall
Laboratory Manager

Date: August 1, 2013

Eberline Services | Oak Ridge Laboratory
601 Scarboro Road
Oak Ridge, TN 37830
Phone: (865) 481 - 0683, Fax: (865) 83 - 4621

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MISSION STATEMENT

Our mission is to ensure that all of The Eberline Services, Oak Ridge Laboratory s-systems, services, processes, and deliverables are of a quality that meets or exceeds client requirements; and to foster a Laboratory culture in which there is a commitment to a rising standard of quality. This culture demands that the quality of those systems, services, processes, and deliverables and the methods used to achieve that quality be continuously improved.

Quality Assurance is a spirit that pervades all aspects of an organization. It is the quality attitude developed by a quality culture in an organization. It is the spirit in which any organization, procedure or activity is documented, implemented and performed. This spirit produces empowerment and motivation in al l employees to achieve the highest level of quality. The result of this attitude is **"Quality Assurance."**

The policy guidelines are presented in this Oak Ridge Laboratory Quality Assurance Program Manual, and are based on the philosophy and premises that:

- People are our greatest asset and are ultimately responsible for the quality of the items and services we provide. Therefore, each person is treated with the greatest possible respect and consideration.
- Employees are inherently proud and want to produce top quality and on time services and deliverables. In order to do this they must be made aware of the quality requirements that are expected and must be provided appropriate facilities, equipment, and proper training.
- A culture of quality embodied within the entire Oak Ridge Laboratory organization is the most effective way to provide support for the employee's commitment to quality.
- Management support is paramount, and organizational responsibilities must ensure integration of quality requirements in the day-to-day operations.
- All systems, services, processes, and deliverables can be planned, performed, assessed, and improved.
- Improvements allow operations to become more efficient and result in contractual requirements performed "on time" and done "right the first time."
- Quality improvements lead to reduced costs and allow the ultimate objective of providing the highest quality items and services to be a viable goal.

Quality is our client s-perception of us. Our actions must assure our clients that the Oak Ridge Laboratory organization provides for quality systems, services, processes, and deliverables that will meet or exceed their requirements. To this end, each employee must understand and exercise the highest standards of ethics in the performance of their duties and ensure the integrity of the data they report.

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STATEMENT OF COMPLIANCE AND MATRIX COMPARISON

This Quality Assurance Program Manual addresses the basic requirements outlined in several regulatory manuals, standards, regulations, and national laboratory programs. Matrix comparison to some of these documents is included in the following pages. Additional regulatory requirements are listed in Section 1.0.

NQA-Quality Assurance Requirements for Nuclear Facility Application
National Environmental Laboratory Accreditation Conference (NELAC), USEPA; 2003, the NELAC Institute (TNI), 2009
USEPA Requirements for the Certification of Laboratories Analyzing Drinking Water; 2005
ISO/IEC 17025 for the General Requirements for the Competence of Calibration and Testing
DOE Quality Systems for Analytical Services (QSAS) Document
DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)
PJLA Accreditation Compliance Requirements

This manual is organized as follows:

↑

Name, Title, Authorization and Approval
Table of Contents
Mission Statement
Statement of Compliance and Matrix Comparison
Introduction and Description
Organization and Responsibility
Quality Assurance Objectives
Personnel Qualification and Training
Instructions and Procedures
Procurement Document Control
Material Receipt and Control
Material Storage and Control
Control of Process
Preventative Maintenance
Control of Measurement and Test Equipment
Data Reduction, Verification, and Reporting
Document Control
Internal Quality Control
Audits
Quality Assurance and Inspection Records
Corrective Action
Quality Assurance Reports to Management

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MATRIX COMPARISON

NQA-1, Cross Reference to - Oak Ridge Laboratory Q.A. Program Manual

NQA-1- Quality Assurance Requirements for Nuclear Facility Applications (*Basic Requirements*)		**Oak Ridge, TN laboratory Quality Assurance Program Manual**	
BASIC RQMT	TITLE	QAM SECT	TITLE
1.	Organization	2.0	Organization and Responsibility
2.	Quality Assurance Program	3.0 4.0	Quality Assurance Objectives Personnel Indoctrination and Training
3.	Design Control	N/A	Does not apply
4.	Procurement Document Control	6.0	Procurement Document Control
5.	Instructions, Procedures, and Drawings	5.0	Instructions and Procedures
6.	Document Control	13.0	Document Control
7.	Control of Purchased Items and Services	7.0	Material Receipt and Control
8.	Identification and Control of Items	8.0	Material Storage and Control
9.	Control of Process	9.0	Control of Process
10.	Inspection	14.0	Internal Quality Control
11.	Test Control	14.0	Internal Quality Control
12.	Control of Measurement and Test Equipment	11.0	Control of Measurement and Test Equipment
13.	Handling, Storage, and Shipping	8.0	Material Storage and Control
14.	Inspection, Test, and Operating Status	14.0	Internal Quality Control
15.	Control of Nonconforming Items	8.0	Material Storage and Control
16.	Corrective Actions	17.0	Corrective Actions
17.	Quality Assurance Records	16.0	Quality Assurance and Inspection Records
18.	Audits	15.0	Audits
	N/A	N/A	Title Page
	N/A	N/A	Authorization and Approval Statement
	N/A	1.0	Introduction and Description
	N/A	10.0	Preventive Maintenance
	N/A	12.0	Data Reduction, Verification, and Reporting
	N/A	18.0	Quality Assurance Reports to Management

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MATRIX COMPARISON

10 CFR Part 50, Appendix B Cross Reference to Oak Ridge Laboratory Q.A. Program Manual

NRC 10 CFR Part 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.		**Oak Ridge, TN Laboratory Quality Assurance Program Manual**	
Criterion No.	TITLE	QAM SECT	TITLE
I	Organization	2.0	Organization and Responsibility
II	Quality Assurance Program	3.0	Quality Assurance Objectives
III	Design Control	N/A	Does not apply
IV	Procurement Document Control	6.0	Procurement Document Control
V	Instructions Procedures, and Drawings	5.0	Instructions and Procedures
VI	Document Control	13.0	Document Control
VII	Control of Purchased Material, Equipment, and Deliverables	7.0	Material Receipt and Control
VIII	Identification and Control of Materials, Parts, and Components	8.0	Material Storage and Control
IX	Control of Special Process	9.0	Control of Process
X	Inspections	14.0	Internal Quality Control
XI	Test Control	14.0	Internal Quality Control
XII	Control of Measuring and Test Equipment	11.0	Control of Measurement and Test Equipment
XIII	Handling, Storage, and Shipping	8.0	Material Storage and Control
XIV	Inspection, Tests, and Operating Status	14,0	Internal Quality Control
XV	Nonconforming Materials, Parts or Components	7.0	Material Receipt and Control
XVI	Corrective Actions	17.0	Corrective Actions
XVII	Quality Assurance Records	16.0	Quality Assurance Inspection Records
XVIII	Audits	15.0	Audits
		N/A	Title Page
		1.0	Introduction and Description
		10.0	Preventative Maintenance
		12.0	Data Reduction, Verification, and Reporting
		18.0	Quality Assurance Reports to Management

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MATRIX COMPARISON

DOE Order 414.1**C** Cross Reference to Oak Ridge Laboratory Q.A. Program Manual

DOE Order 414.1 C Quality Assurance			**Oak Ridge, TN Laboratory Quality Assurance Program Manual**
Criterion No.	TITLE	QAM SECT	TITLE
1.	Program	1.0 2.0 3.0 12.0 13.0	Introduction Organization and Responsibility Quality Assurance Objectives Data Reduction, Verification, and Reporting Document Control
2.	Personnel Training and Qualification	4.0	Personnel Indoctrination and Training
3.	Quality Improvement	17.0	Corrective Actions
4.	Documents and Records	16.0 18.0	Quality Assurance Records Quality Assurance Reports to Management
5.	Work Process	5.0 9.0 10.0 14.0	Instructions and Procedures Control of Process Preventive Maintenance Internal Quality Control
6.	Design	N/A	Does not apply
7.	Procurement	6.0 7.0 8.0	Procurement Document Control Material Receipt and Control Material Storage and Control
8.	Inspection and Acceptance Testing	11.0 14.0 15.0	Control of Measurement and Test Equipment Internal Quality Control Audits
9.	Management Assessment	2.0	Organization and Responsibility
10.	Independent Assessment	15.0	Audits
N/A		N/A	Title Page
N/A		N/A	Authorization and Approval Statement

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MATRIX COMPARISON

DOE Quality Systems (QSAS). And DoD Quality Systems (QSM) Cross Reference to Oak Ridge Laboratory QA Program Manual.

This cross reference applies also to NELAC Chapter 5.4.2.3

NELAC Chapter 5 Quality Systems		**Oak Ridge, TN Laboratory Quality Assurance Program Manual**	
4.2.6 RQMT	TITLE	QAM SECT	TITLE
	Title Page		Title Page
(a)	Policy statement, objectives, commitment by top management	1.0 3.0	Introduction and Description Quality Assurance Objectives
(b)	Organization and Management structure, Org Charts	2.0	Organization and Responsibility
(c)	Relationship between management, technical operations, support services and the quality system	2.0	Organization and Responsibility
(d)	Document control and records retention	16.0	Quality Assurance & Inspection Records
(e)	Job Descriptions	4.0	Personnel Indoctrination and Training
(f)	Approval signatories, signed concurrences	A&A	Authorization and Approval Statement
(g)	Traceability of measurements	14.0	Internal Quality Control
(h)	List of test methods	9.0	Control of Process
(i)	Review for facility and resource availability	9.0	Control of Process
(j)	Calibration or verification test procedures	5.0	Instructions and Procedures
(k)	Procedures for handling submitted samples	9.0	Control of Process
(l)	Major equipment and measurement standards	9.0 11.0	Control of Process Control of Measurement & Test Equipment
(m)	Calibration, verification, & maintenance	11.0	Control of Measurement & Test Equipment
(n)	Inter laboratory comparison, proficiency testing, reference material, internal Q.C.	14.0	Internal Quality Control
(o)	Corrective actions	17.0	Corrective Actions
(p)	Departures from policy/procedures	5.0	Instructions and Procedures
(q)	Complaints	1.0	Introduction and Description
(r)	Confidentiality and Proprietary rights	1.0	Introduction and Description
(s)	Audits and Data reviews	12.0 15.0	Data Reduction, Verification, and Reporting Audits
(t)	Personnel experience and training	4.0	Personnel Indoctrination and Training
(u)	Ethical and legal responsibilities	1.0	Introduction and Description
(v)	Analytical results reporting	12.0	Data Reduction, Verification, and Reporting
(w)	Table of Contents	TOC	Table of Contents

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MATRIX COMPARISON

10 CFR Part 830.122 Cross Reference to Oak Ridge Laboratory Q.A. Program Manual

10CFR 830.122 Quality Assurance Criteria			**Oak Ridge, TN Laboratory Quality Assurance Program Manual**
Criterion No.	TITLE	QAM SECT	TITLE
830.122 (a)	Management/Program	1.0 2.0	Introduction Organization and Responsibility
(b)	Management/Personnel Training and Qualification	4.0	Personnel Indoctrination and Training
(c)	Management/Quality Improvement	3.0 14.0 17.0	Quality Assurance Objectives Internal Quality Control Corrective Actions
(d)	Management/Documents and Records	5.0 9.0 12.0 13.0 16.0 18.0	Instructions and Procedures Control of Process Data Reduction, Verification, and Reporting Document Control Quality Assurance Records Quality Assurance Reports to Management
(e)	Performance/Work Process	7.0 8.0 10.0 14.0	Material Receipt and Control Material Storage and Control Preventive Maintenance Internal Quality Control
(f)	Performance/Design	N/A	Does not apply
(g)	Performance/Procurement	6.0	Procurement Document Control
(h)	Performance/Inspection and Acceptance Testing	11.0 14.0 15.0	Control of Measurement and Test Equipment Internal Quality Control Audits
(i)	Assessment/Management Assessment	2.0	Organization and Responsibility
(j)	Assessment/Independent Assessment	2.0 15.0	Organization and Responsibility Audits
N/A		N/A	Title Page
N/A		N/A	Authorization and Approval Statement

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MATRIX COMPARISON

EPA SW-846 Cross Reference to - Oak Ridge Laboratory Q.A. Program Manual

EPA SW-846 (Essential Elements)		**Oak Ridge, TN Laboratory Quality Assurance Program Manual**	
BASIC RQMT	TITLE	QAM SECT	TITLE
1.	Title Page	N/A	Title Page
2.	Table of Contents	N/A	Table of Contents
3.	Project Description	1.0	Introduction and Description
4.	Project Organization and Responsibility	2.0	Organization and Responsibility
5.	Q.A. Objectives	3.0	Quality Assurance Objectives
6.	Sampling Procedures	N/A	Does not apply to laboratory
7.	Sample Custody	9.0	Control of Process
8.	Calibration Procedures and Frequency	11.0	Control of Measurement and Test Equipment
9.	Analytical Procedures	5.0 9.0	Instructions and Procedures Control of Process
10.	Data Reduction, Validation, and Reporting	12.0	Data Reduction, Verification, and Reporting
11.	Internal Quality Control Checks	14.0	Internal Quality Control
12.	Performance and System Audits	15.0	Audits
13.	Preventive Maintenance	10.0	Preventive Maintenance
14.	Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completion	14.0	Internal Quality Control
15.	Corrective Action	17.0	Corrective Actions
16.	Quality Assurance Reports to Management	18.0	Quality Assurance Reports to Management
N/A		N/A	Authorization and Approval Statement
N/A		4.0	Personnel Indoctrination and Training
N/A		6.0	Procurement Document Control
N/A		7.0	Material Receipt and Control
N/A		8.0	Material Storage and Control
N/A		13.0	Document Control
N/A		16.0	Quality Assurance and Inspection Records

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MATRIX COMPARISON

EPA QA/R-5 EPA Requirements for Quality Assurance Project Plans

EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans		Oak Ridge, TN Laboratory Quality Assurance Program Manual	
RQMT	**TITLE**	**SECT**	**TITLE**
A	**Project Management**		
A1	Title and Approval Sheet		Title Page Authorization and Approval (A&A) Statement
A2	Table of Contents		Table of Contents Page Headers (document control)
A3	Distribution List		Title Page
A4	Project/Task Organization	1.4 2.1 2.2 2.5	Introduction Organizational Structure Responsibility Organization Charts
A5	Problem Definition/Background	3.0 9.0 14.0	Quality Assurance Objectives Control of Process Internal Quality Control
A6	Project/Task Description	9.0	Control of Process
A7	Quality Objectives and Criteria	3.0	Quality Assurance Objectives
A8	Special Training/Certification	4.0	Personnel Indoctrination and Training
A9	Documents and Records	5.0 9.2 13.0 16.0	Instructions and Procedures Documented Procedures Document Control Quality Assurance and Inspection Records
B	**Data Generation and Acquisition**		
B1	Sampling Process Design (Experimental Design)	N/A	
B2	Sampling Methods	N/A	
B3	Sample Handling and Custody	14.4	Sample Custody
B4	Analytical Methods	5.0 9.0	Instructions and Procedures Control of Process
B5	Quality Control	14.0	Internal Quality Control
B6	Instrument/Equipment Testing, Inspection, and Maintenance	10.0 11.0	Preventive Maintenance Control of Measurement and Test Equipment
B7	Instrument/Equipment Calibration and Frequency	11.0	Control of Measurement and Test Equipment
B8	Inspection/Acceptance of Supplies and Consumables	7.0 8.0	Material Receipt and Control Material Storage and Control
B9	Non-direct Measurements	10.0	Data Reduction, Verification, and Reporting
B10	Data Management	10.0	Data Reduction, Verification, and Reporting
C	**Assessment and Oversight**		
C1	Assessments and Response Actions	15.0 17.0	Audits Corrective Action
C2	Reports to Management	18.0	Quality Assurance Reports to Management
D	**Data Validation and Usability**		
	Data Review, Verification, and Validation	12.0	Data Reduction, Verification, and Reporting

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EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans		Oak Ridge, TN Laboratory Quality Assurance Program Manual	
RQMT	**TITLE**	**SECT**	**TITLE**
D1		14.3	Data Verification
D2	Verification and Validation Methods	12.0	Data Reduction, Verification, and Reporting
D3	Reconciliation with User Requirements	12.0	Data Reduction, Verification, and Reporting

1.0 INTRODUCTION AND DESCRIPTION

1.1 PREFACE

Eberline Services ‼ Oak Ridge Laboratory is a radiochemistry laboratory that specializes in providing services for radiological assays to the environmental industry. Radionuclides are quantified within materials such as surface water, ground water, drinking water, wastewater, soil, sediment, sludge, vegetation, and hazardous waste. Bioassay (urine) analysis is performed for total uranium. The objective of the laboratory is to produce the highest quality data that are accurate, precise, legally defensible, and meet our clients data needs and requirements in a timely and cost effective manner.

The management of Eberline Services, Oak Ridge Laboratory is committed to a rigorous Quality Assurance (Q.A.) Program. While this commitment is necessary for the normal conduct of business, our basic policies dictate the highest standards of ethics and integrity in the conduct of our affairs. This philosophy and the specific procedures to attain policy objectives fromthe framework of our Q.A. Program. We will provide only those services that are within our qualifications and with confidence tha t our Q.A. Program and all related operating procedures dictate reliable performance of those services.

1.2 PURPOSE

This manual outlines management's Q.A. policy and establishes a requirement that procedures be promulgated and implemented to accomplish all of the quality assurance elements necessary to fulfill our responsibility to meet or exceed client or regulatory specifications. It also provides a means for creating mutual understanding regarding our Q.A. program and reliability techniques with our subcontr actors, suppliers, and clients. This Eberline Services -Oak Ridge Laboratory Quality Assurance Program provides the structure, policies and responsibilities for the execution of quality control and quality assessment operations to assure that the laboratory meets defined standards of quality.

1.3 SCOPE

This Quality Assurance Program Manual provides guidance to meet operational Q.A. requirements.

In addition to the documents identified in the Cross Reference Section, this Manual complies with applicable requirements of the following the latest revisions of regulations below:

1.3.1 NRC 10 CFR Part 21, "Reporting of Defects and Non-compliance."

1.3.2 ANSI/ANS-10.3-, "Documentation of Computer Software.

1.3.3 NRC Regulatory Guide 4.15, Rev. 1, "Quality Assurance for Radiological Monitoring Programs - Effluent Streams and the Environment."

1.3.4 U.S. EPA QA/R-5, "EPA Requirements for Quality Assurance Program Plans."

1.3.5 DOE Order 414.1C Quality Assurance.

1.3.6 ISO/IEC 17025, "General Requirements for the Competence of Calibration and Testing Laboratories."

1.3.7 USEPA Directive 2185, Good Automated Laboratory Practices (GALP).

1.3.8 DOE Quality Systems for Analytical Services (QSAS)

1.3.9 DoD Quality Systems Manual for Environmental Laboratories (DoD QSM)

1.3.10 A National Environmental Laboratory Accreditation Conference (NELAC) Chapter 5 Quality Systems , July 2003.

1.3.11 USEPA Manual for the Certification of Laboratories Analyzing Drinking Water, EPA 815 - R-004, January 2005.

1.4 INTRODUCTION

Quality assurance, as outlined herein, is a tool that allows management to util ize the expertise and experience of all personnel on the job. It requires each worker to be aware of his/her work environment and to continually evaluate methods and processes to ensure that the best and correct operation is being performed. It requests ea ch employee to identify and suggest any improvement to the processes while performing an operation. Improvements or changes shall be coordinated with management who will validate improvement and disseminate the information to all affected personnel. Manage ment shall also, as needed, change procedures and provide additional training. This program also requires that all personnel be qualified, and trained on a continuing basis to maintain that qualification and be assimilated into the Oak Ridge Laboratory quality culture.

Management will provide resources, tools, equipment, scheduling, and training to ensure personnel can perform their duties effectively.

1.4.1 Management will also ensure that internal assessments are performed annually to evaluate management and p rocesses with feedback for review with a goal of improving all areas of operations.

1.4.2 It is only by having a quality assurance culture, with all personnel involved, that a system, service, or product can be provided with full assurance that the best possible work, the best possible product, or the best possible service has been provided.

1.4.3 In order to ensure that this manual is an effective management tool, subjects that are not normally considered quality assurance, i.e. safety, security, etc., are addressed in other management documents.

1.4.4 The following titled designations of positions are used within the Oak Ridge, TN Laboratory:

Laboratory Manager: Refers to the General Manager of the Oak Ridge Laboratory.

Radiation Safety Officer (RSO): Refers to the RSO of the Oak Ridge Laboratory.

Emergency Coordinator: Refers to the individual who is responsible for overseeing and directing activities and protocols associated with emergencies and disasters.

Project Manager: Refers to an individual who is responsible for client service activities and is the single point of contact with a client for the laboratory.

Supervisor: Refers to individuals within the laboratory who are responsible for the operational functions of a group of personnel.

Q.A. Manager: Refers to the individual who is responsible for the Laboratory s Q.A.

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Program.

1.5 DESCRIPTION

This document outlines the organization of the Q.A. functions within the laboratory. It depicts the lines of authority, and lists the duties and responsibilities within th e organization. It provides direction for the preparation of Procedures Manuals, which provide the detailed methods of processes and analyses that accomplish the goal of quality data in terms of precision, accuracy and reproducibility.

1.6 CONFIDENTIAL AND PROPRIETARY INFORMATION

Oak Ridge Laboratory employees are exposed to confidential and/or proprietary information pertaining to the company and its clients. Information concerning the report of analysis, radiation dosimetry records, audit reports, calibration reports, and other documents relating to a project are considered confidential. This information is to be released only to the client or to the client's authorized representative. Each employee will sign an agreement with the Oak Ridge, TN Laboratory concerning the security of proprietary and confidential information. A copy of the agreement will be retained in the employee's personnel file (at the corporate office in Albuquerque, NM).

1.7 TECHNICAL COMPLAINTS

Technical complaints will be addressed b y the Laboratory Manager, Project Manager, Quality Assurance Manager, or staff member with expertise in the area of complaint. If the complaint is not valid, every attempt will be made to satisfy the client. If the complaint is determined to be valid, the cause of the complaint shall be identified and corrected as soon as feasible. Verification that the cause for a valid complaint has been corrected is the responsibility of the individual addressing the complaint. Details of all technical complaints shall b e recorded and maintained in the customer's project file. Clients are also encouraged to provide feedback on the Eberline Analytical website via a statement on each client report.

1.8 ETHICAL AND LEGAL RESPONSIBILITIES

Eberline Services-Oak Ridge Laborato ry utilizes a clearly stated ethics policy that is discussed with all new employees during orientation. Each employee is required to understand the high standards of ethics and integrity required in order to perform their duties and to ensure the integrity of the data reported in connection with their employment at the Oak Ridge Laboratory. Each employee will understand that intentionally reporting data that are not the actual values obtained, intentionally reporting dates and/or times or data analyses that are not the actual dates and/or times of analyses, intentionally representing another individuals work as their own; or any other action that may affect the integrity of the data reported by the laboratory; will be the cause for dismissal.

1.9 ACCREDITATIONS

Through applications, pre-qualification, performance testing, and external auditing programs; the laboratory has been granted certification by different agencies, organizations, and states. The Laboratory maintains proficiency as required by the cli ents and regulatory certifying agency. The Quality Assurance Manager maintains credentials and lists of certifying agencies. The list of certifications maintained by the Oak Ridge Laboratory includes:

State of Tennessee, Department of Health – Laboratory Division
State of California, Department of Public Health – ELAP Branch
State of South Carolina, Dept of Health & Environmental Control, Environmental Lab Certification Program

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State of Utah, Department of Health Bureau of Laboratory Improvement
State of New Jersey, Department of Environmental Protection, Office of Quality Assurance
State of New York, Department of Health, Environmental Lab Approval Program
State of North Dakota, Dept. of Health Environ. Lab. Certification Program- Chemistry Division
State of Nevada, Dept. of Conservation Bureau of water Quality EnvironmentalLab Services
State of Louisiana, Department of Environmental Quality
State of Texas, Texas Commission of Environmental Quality
State of Alabama, Department of Environmental Management
Commonwealth of Virginia, Dept. of General Services Division of Consolidated Lab Services
State of Washington, Department of Ecology**Perry Johnson Laboratory Accreditation, Inc.**
Department of Energy (DOE)
Department of Defense (DoD)

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2.0 ORGANIZATION AND RESPONSIBILITY

2.1 ORGANIZATIONAL STRUCTURE

The Laboratory Manager has overall responsibility for this Quality Assurance Program (hereafter referred to as the Program). In this capacity, he has delegated the responsibility for formulation, implementation, and execution of the Program to the Laboratory Q.A. Manager.

Current organizational charts, identifying key individuals and the structure of the laboratory, are included in the "Statement of Qualifications." Additional organizational structure, functional responsibilities, levels of authority, and lines of communication for management, direction, and execution of the Program are documented below.

2.2 RESPONSIBILITY

Laboratory Management will periodically assess the integrated quality assurance program, its performance, and its effectiveness. Problems that hinder the organization from achieving its objectives will be identified and corrected.

Management will provide training and qualification to ensure quality products and services. Every employee is responsible for supporting the QA program policies, procedures, and guidance with each employee being responsible for their work. Professional qualifications and experience of all individuals and positions are maintained. Position descriptions and resumes are kept on file in the QA office. The specific duties of selected personnel are described below. Other job descriptions are located within an employee's training file in the QA office.

2.2.1 Laboratory Manager

The Laboratory Manager, under the authority of the President of Eberline Analytical Corporation, is responsible for the overall laboratory productivity and optimization of the efforts of the analytical staff and those who directly support the analytical effort. Staff interacts with the Lab Manager throughout the day. The Laboratory Manager is responsible for the implementation of regulatory standards, and national program requirements (NELAP, TNI, DOE, and DoD). The Laboratory Manager is responsible for the all safety aspects of the laboratory operations

The duties of the Laboratory Manager include the following.

- Overall direction and general administration.
- Daily operation of the laboratory.
- Review of analytical procedures and practices.
- Recruitment, hiring, assignment, evaluation and termination of personnel.
- Training and professional development of staff.
- Review of proposals, bids, pricing and quotations.
- Perform an annual assessment of the laboratory operation.

2.2.2 Quality Assurance Manager

The Quality Assurance Manager operates independently from line management while reporting to the Laboratory Manager. The QA Manager has sufficient authority and organizational freedom to identify quality problems, to initiate, recommend or provide solutions; to verify implementation of solutions, and if necessary, to stop work until the problem is resolved. The QA Manager has independence from cost scheduling, and production considerations. In his capacity, he has the authority to control processing, delivery, installation, or use of items or services until proper disposition of an identified non-conformance, deficiency, or condition adverse to quality. The QA

Manager has a direct line of communication to the President of Eberline Analytical Corporation for matters of quality.

The duties and responsibilities of the QA Manager are as follows.

- § Develop QA procedures, instructions and plans.
- § Maintain surveillance over all applications of the QA P rogram; make recommendations for resolution of problems, or further evaluation by management.
- § Monitor external audits, write responses, and ensure corrective actions.
- § Issue non-conformances and formal corrective action(s).
- § Issue stop-work orders for work that is not in compliance with requirements.
- § Direct, and maintain records of analytical performance evaluation programs to ensure full and prompt participation and evaluation of results and derivation of all benefits relating there from.
- § Direct, and maintain records of laboratory certification programs.
- § Authorized to sign and designate other personnel to sign client related Certificates of conformance and/or non-conformance.
- § Ensures compliance with Regulatory Standards and National Program requirements (e.g. NELAP, TNI, DOE, DoD, . . .)

2.2.3 Health and Safety Manager

The Health and Safety Manager reports directly to the Laboratory Manager and oversees the daily implementation of the laboratory s health and safety program. The program includes an integrated chemical hygiene plan, safety orientation and training, radiation safety plans and training, sample disposal and shipment, and safety checks and audits.

- § The duties and responsibilities of the Health and Safety Manager are as follows.
- § Administer chemical hygiene, safety, fire extinguisher, etc. training.
- § Management of sample disposal in conformance with the waste disposal policy.
- § Packaging and shipment of samples, or designation thereof, following DOT regulations.
- § Maintain Material Safety Data Sheet (MSDS) documentation.
- § Direct spill response.
- § Direct safety checks and audits.
- § Ensures compliance with regulatory standards and national program requirements (NELAP, TNI, DoD, DOE, . . .)

2.2.4 Technical Director

The Technical Director reports directly to the Laboratory Manager and provides technical direction or advice for the laboratory operations and/orspecial programs, projects, or activities.

- § The duties and responsibilities of the Technical Director are as follows.
- § Perform technical analysis for specific projects.
- § Make recommendations for research and development.
- § Write technical manuals.
- § Design systems, procedures, and documentation as necessary.
- § Assist chemistry supervisors and technicians in technical interpretation of program requirements.
- § Consult with clients, make recommendations regarding analytical schemes.

2.2.5 Data Review Department Staff

The Data Review Department has been structured to handle the specific project requirements of

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our clients. The Department is responsible for producing quality control (QC) reports, for ensuring proper assembly of data packages and production of electronic data deliverables (EDDs) that meet the requests of the clients. Data Review personnel, in concert with the QA Manager, will assess the requirements of the various programs and client specific requirements, then interact with the appropriate laboratory personnel to ensure compliance with the client's statement of work. These efforts improve the accuracy and efficiency with which QC reports and data packages are prepared and forwarded to the client. Data deliverables are those items associated with the analyses of samples that are provided to the client.

Data Review staff responsibilities include the following.

- § Assuring that analytical data have been correctly entered in the final report.
- § Assuring that data are not released without reviews.
- § Assuring that all data are released to the correct contact person.
- § Producing QC reports.
- § Assembling Data Packages.
- § Ensuring that submitted EDD are complete, verified and in appropriate format.

2.3 ASSESSMENT

2.3.1 The Laboratory Manager will perform routine and continuous assessment of the management system to identify, correct, and prevent management problems that hinder achievement of the organization's objective. The assessment will focus on broad categories of management issues to determine the effectiveness of the integrated managementsystem.

2.3.2 Laboratory Manager's assessments will not be conducted to verify conformance to regulations, product standards, or established procedures, but will evaluate customer and employee perceptions relative to the following key issues.

- § Mission and strategic objectives of the organization.
- § Employees' role in the organization.
- § Customers' expectations and degree to which expectations are being met.
- § Opportunities for improving quality and cost effectiveness.
- § Recognizing and enhancing human resource capabilities.

2.3.3 Results of the Laboratory Manager's management assessment and recommendations will be documented annually. Decisions and related actions resulting from the recommendations will be properly followed up and evaluated for their effectiveness. Moreover, the opportunity for customer feedback is afforded by means of an on-line customer feedback/satisfaction survey on the laboratory website.

2.4 ORGANIZATION CHARTS

2.4.1 The Oak Ridge Laboratory Organization is illustrated in Figure 2.1

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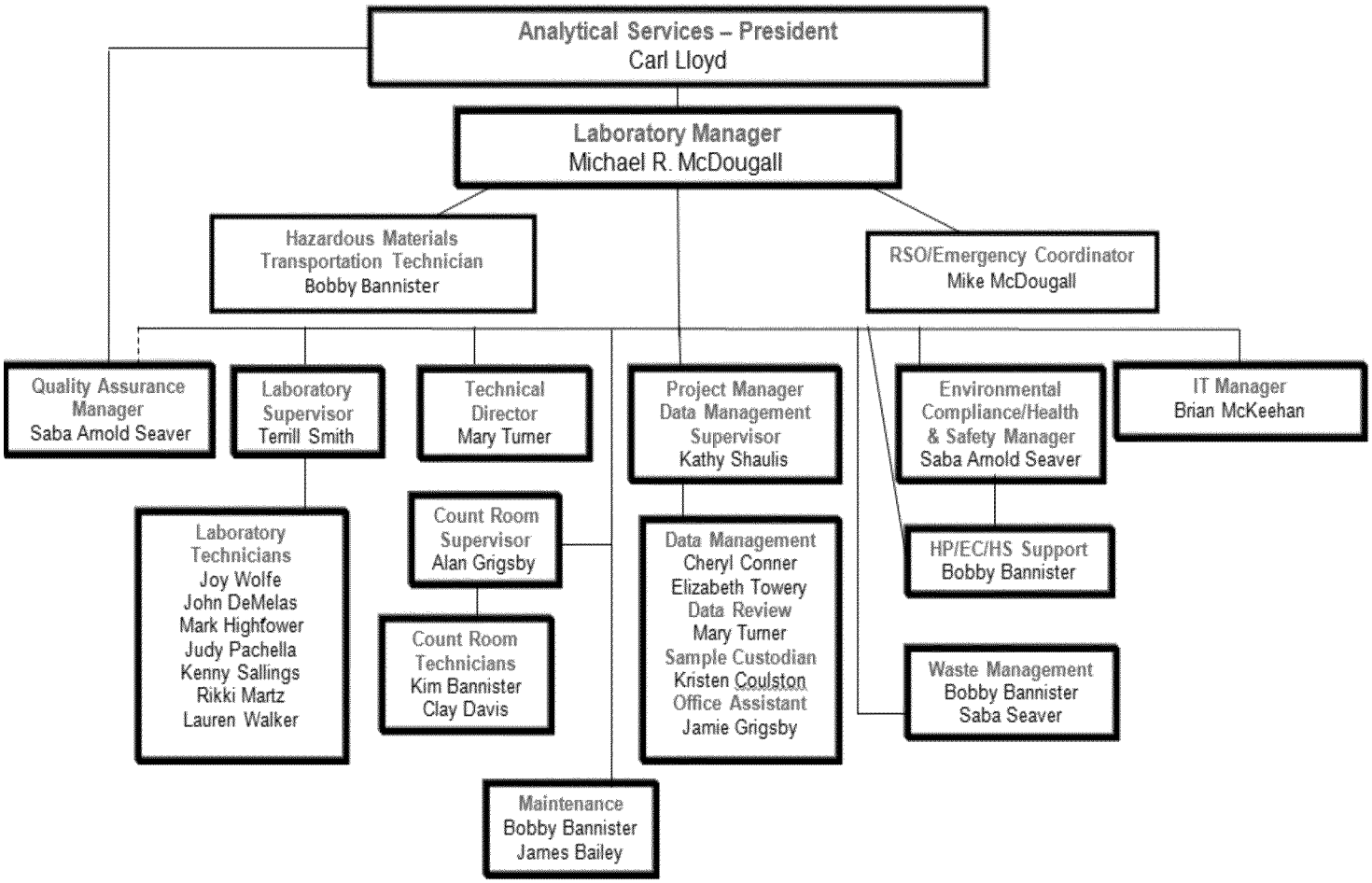
Figure 2.1
Oak Ridge, TN Laboratory Organization



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3.0 QUALITY ASSURANCE OBJECTIVES

3.1 OBJECTIVES

The Oak Ridge Laboratory Q.A. Program is organized to meet the following objectives.

3.1.1 To ensure performance of those actions that provide confidence that quality isachieved.

3.1.2 To provide an effective control for the verification of characteristics of all systems, services, and processes that produce data of the required quality.

3.1.3 To ensure that systems, services, processes, and deliverables meet the rigid quality and reliability standards of the Oak Ridge Laboratory. Also, to ensure that individual client criteria pursuant to these standards are met.

3.1.4 To provide a continuing monitoring service for review of operating procedures, and for overall effectiveness and evaluation of the Q.A. Program. Also, to provide observations and recommendations for improvement in all areas of laboratory operations where quality may be affected.

3.1.5 To ensure the program provides valid records of the control measures applied to all factors bearing on the result of investigations.

3.1.6 To ensure the assessment of results provides feedback to improve the process.

3.1.7 To foster a culture of commitment to achieve a rising standard of quality that demands that the methods utilized to achieve the quality systems, services, processes, and deliverables be continuously monitored and improved.

3.2 QUALITY IMPROVEMENT

Operational processes will be reviewed continually by management and employees to detect and prevent problems and to ensure quality improvement. Any item or process that does not meet established requirements will be identified, controlled, and corrected. The cause of problems will be identified with corrections made to prevent recurrence. Item reliability, process implementation, and quality-related information will be reviewed and the data analyzed to identify items and processes needing improvement.

3.3 RESPONSIBILITIES

Employees are an integral part of the organization and are responsible to be aware of their work environment, to review operational processes and materials utilized, to identify any problems, and to make suggestions and recommendations for improvement. Employees are empowered to make and/or recommend corrections to improve operations and to prevent recurrence of the problems. Employees are also empowered, through their supervisor, to stop work where detrimental ethical, contractual, quality, safety, or health conditions exist. Management will immediately be made aware of any situations requiring work stoppage.

All employees are responsible for s upporting the Program in principle and in detail and shall retain responsibility for the quality of their work.

Management is responsible to be actively involved in the quality improvement process to ensure

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proper focus is maintained and for resolution of difficult issues. Management will maintain a no fault attitude to encourage employees to identify problems that compromise safety and reliability. Management will consider all recommendations for quality improvement and will recognize employee contributions.

3.4 CORRECTIONS

Items and processes that do not meet established requirements must be identified, documented, analyzed, and resolved. Corrective actions will be implemented and followed up to ensure effectiveness.

No laboratory analytical data will be revised or corrected after reporting to clients without full documentation of the process. The documentation must show: a) what necessitated the change; b) details of the change in terms of re -run records or recalculation; c) approval process for the change; d) formal client notification.

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4.0 PERSONNEL QUALIFICATION AND TRAINING

4.1 QUALIFIED PERSONNEL

4.1.1 The Oak Ridge Laboratory personnel who perform activities that affect quality will have education, experience and training to ensure that suitable proficiency is achieved and maintained. A job description, identifying position qualification and duty requirements, will be included in each individual's training records.

4.1.2 All personnel will have training outlining their ethical and legal responsibilities, including th e potential punishment and penalties for improper, unethical, or illegal actions.

4.1.3 Personnel performing technical functions or processes will have known and documented related work experience and minimum qualifications of education.

4.2 RESPONSIBILITY

4.2.1 Supervisors are responsible for initial evaluation of capabilities and qualifications of assigned personnel and will assign those personnel to perform functions based on the individual's qualifications and abilities.

4.2.2 Supervisors and managers are responsible for the day-to-day monitoring of assigned personnel for evidence of unethical, improper, or illegal activities.

4.2.3 Appropriate training is the responsibility of the supervisors with support from management. Training will address specific needs and will vary accord ing to each job's requirements and previous experience of the employee, and will ensure:

4.2.3.1 Understanding of the fundamentals of the work and its context,

4.2.3.2 Understanding of the processes and tools being used, the extent and sources of variability in those processes and tools, and the degree to which control over the variability is maintained,

4.2.3.3 Emphasis on correct performance of the work, understanding why quality requirements exist, and potential consequences of improper work, and

4.2.3.4 Emphasis on "doing it right the first time. A particular emphasis is placed on employee safety.

4.2.4 Management will provide ALL employees the resources, tools, equipment, scheduling, and structured training to ensure personnel can perform their duties effectively. New employees will receive detailed information concerning the general corporate policies and the specific laboratory safety practices, and security policies. Training shall be conducted on an individual basis to achieve and maintain suitable proficiencies. The training will include, but will not be limited to:

- Ethical and Legal responsibilities
- Health and Safety
- Radiation Protection
- Waste Management
- Quality Assurance
- Laboratory Procedures
- LIMS Operation

4.2.5 Access to all laboratory documents and procedures will be available at all times to all employees who will be expected to familiarize themselves with these documents.

4.2.6 Milestone achievements or unique training will be noted by the supervisors via entry in the training records. Available certificates of traini ng, education, or awards will also be maintained with the individual's training records.

4.2.7 Supervisors will monitor individual work habits to ensure proficiency is maintained, to note progressive improvement, and to identify any needed supportive training. Additional training requirements will be developed by the individual's supervisor.

4.2.8 As needed, employees will be informed of the requirements of special clients/programs necessary to achieve their duties and responsibilities. Familiarization will be made a matter of record.

4.2.9 All personnel training records will be maintained in the QA office. The details for maintenance of training requirements and records are outlined in the Oak Ridge Laboratory Management Procedure, MP-042 Personnel Training."

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5.0 INSTRUCTIONS AND PROCEDURES

5.1 POLICY

The Oak Ridge Laboratory policy uses written and approved procedures for routine activities and for analytical and operational processes. Applicable Laboratory procedures are available to all personnel. The most current revision of the appropriate procedure will be maintained and documented on the laboratory computer server. Departures from routine procedures due to non-standard situations or specific requests from clients will be approved by management and fully documented.

In addition to analytical procedures (AP) the laboratory maintains Management Procedures (MP) that describe the policy and approach for performing quality functions. Separate procedures for Health and Safety, Radiation Protection and Waste Management, are also maintained.

5.1.1 ANALYTICAL PROCEDURES

Analytical procedures are descriptions of particular protocols for testing or operations. Analytical procedures will be developed based on published reference procedures for each test or process, and authorized for use by the Laboratory Manager.

5.1.2 Qualification requirements for personnel performing operations and criteria used to determine the proficiency of the operator will be documented.

5.1.3 Each technical procedure will include a list of Personal Protective Equipment (PPE) required for the operation being performed. Training for the identification, operation, use, limitations, and disposal of the PPE will be conducted.

5.1.4 Each technical procedure will identify any chemicals/reagents required for completion of the operation. Material Safety Data Sheets (MSDSs) for those chemicals/reagents will be readily available, and training applicable to the MSDSs will be conducted.

5.1.5 Training will be conducted to the procedures used for processing wastes generated within the appropriate chemistry laboratory.

5.2 PROCEDURE MANUALS

Procedure manuals consist of the individual analytical procedures for a laboratory area or for an operation combined into one document. The procedures within the manual define all parameters of the operations being performed to include required accuracy and completeness of specific measurement parameters involved. Procedures will be incorporated into procedure manuals. Signature on the Authorization and Approval page applies to all procedures in the manual.

5.3 FORMAT AND DISTRIBUTION

5.3.1 Procedures will comply with the format prescribed in the laboratory management procedure (MP-021, Preparation of Technical and Project QA Documents) and will be approved by the QA Manager and the Laboratory Manager.

5.3.2 Employee access to the most current revision of procedures and manuals will be through the Laboratory computer server. Any distribution of controlled copies of any Laboratory procedure will be in accordance with the laboratory's document control protocol.

5.3.3 The Laboratory Manager is responsible for the maintenance and security of the original electronic version of all laboratory procedures and manuals and for ensuring that the most current revision of the procedures and manuals are promptly posted and accessible to all employees.

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5.4 REVIEW

Laboratory technical procedure, manuals and Quality Assurance Plan wil l be reviewed annually and whenever program or procedural changes occur with updates as appropriate. Such reviews will be documented. All effected laboratory personnel and document holders will be made aware of any changes. Training of laboratory personnel on new changes will be conducted as necessary.

5.5 REVISION

5.5.1 The appropriate supervisor, or designated representative, is responsible for revisions or changes to the applicable procedure manuals.

5.5.2 Revisions are reviewed and approved by the organization(s) and personnel responsible for the original document. When possible, revisions or changes will be accomplished on a page replacement basis.

5.5.3 The Q.A. Manager will be advised of any changes in procedures required to satisfy specifications of the client.

5.5.4 The final revision shall be reviewed, approved, and authorized by the laboratory manager and QA manager. The electronic copy is placed on the laboratory server for access.

5.5.5 The Q.A. Manager will be responsible for the electronic retention of past revised and superseded procedures. The Q.A. Manager will also be responsible for maintaining the server location where current revisions are stored for employee reference.

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6.0 PROCUREMENT DOCUMENT CONTROL

6.1 PURCHASING

Procurement of material, components, supplies, reagents, equipment, and services necessary to carry on the business interests of the Oak Ridge Laboratory is initiated by purchase requisition and controlled by the use of an authorized purchase order number. To the extent necessary, purchase orders will require suppliers to have a Q.A. program consistent with the requirements of this document. Detailed information on procurement is outlined in the laboratory's Purchasing Procedure.

6.2 PURCHASE REQUISITION REVIEW

Purchase requisitions or change orders are reviewed by purchasing department personnel to ensure conformance to the procurement requirements. As applicable, quality related requisitions are reviewed by Q.A. personnel prior to being processed. Change orders undergo the same review process.

6.3 CERTIFICATION/CERTIFICATE OF CONFORMANCE

All materials and processes requiring certification and certificates of conformance are identified on the face of the purchase requisition. Adequate information is provided to ensure supplier compliance to the required specifications. The Q.A. Manager is responsible for the retention, filing, and recall of material certification or certificates of conformance.

6.4 SUBCONTRACTS

When subcontracting analytical work, Oak Ridge Laboratory Management will ensure that the subcontractor can meet all the technical specification, maintain the appropriate certification (NELAP, DOE, DoD, State, . .) and that the prospective subcontractor has a QA program consistent with the requirements of this document. The Oak Ridge Management will secure the client approval for subcontracting their analytical work prior to commencement of the subcontract. The Q.A. Manager is responsible for evaluation and acceptance of the subcontractor's Q.A. program.

6.5 VENDORS

6.5.1 For procurement of quality-related items or services, the Q.A. Manager is responsible for vendor evaluation and approval. Analytical service vendor evaluation and qualification will be through accreditation as a secondary standard calibration laboratory (NVLAP, NIST); an audit by Oak Ridge Laboratory personnel or an acceptable audit agency; or facility inspection, test reports, or receipt inspections, when the quality of the materials or service can be verified by these methods. Documentary evidence that products and services conform to procurement requirements will be provided and retained. A list of approved vendors will be maintained by the Procurement Office.

6.5.2 The effectiveness of the control of quality by contractors and subcontractors will be assessed at intervals consistent with the importance, complexity, and quantity of the product or services.

6.5.3 The purchasing department is responsible for maintaining a record of quality related materials received from vendors including any reports for non-conforming material.

6.6 QUALITY RELATED SERVICES

Q.A. personnel will review the purchase requisitions for quality related services. Those services that are determined to be quality related will include, as applicable, a statement, or wording, in the body of the purchase order or by attachment identifying the applicable requirement.

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7.0 MATERIAL RECEIPT AND CONTROL

7.1 POLICY

Only material components, supplies, reagents or standards with acceptable quality characteristics and from qualified vendors will be allowed into the laboratory.

7.2 RESPONSIBILITY

Receipt and initial verification of all materials and equipment received by the Oak Ridge Laboratory, either purchased or contract (client) supplied, is the responsibility of the receiving or designated individual. Technical verification for materials and equipment will be pe rformed by the requisitioner or Q.A. Manager, whichever is applicable. Quality related purchase order items will be receipt inspected by Q.A. personnel.

7.3 MATERIAL CONTROL

Purchased material is controlled by the Laboratory Supervisor or designated individual.

7.3.1 The receiving and stock control clerk, or designated individual, is responsible for the expedient and correct routing of all initially accepted received materials to stock, or to the requisitioner.

7.3.2 Purchasing department personnel are responsible for maintaining a rec ord of materials received from v endors, includ ing Rejected Material Report or equivalent form, for any non -conforming material.

7.4 NON-CONFORMING MATERIAL

When received material, affecting quality, has been determined to be non -conforming, the requisitioner will work with the purchasing agent and will be responsible for proper processing.

7.5 RECORDS

Records of receipt of services and supplies that affect the quality of laboratory operation willbe identified with date of receipt, expiration date, source, lot or serial identifier, and calibration or certification records as appropriate.

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8.0 MATERIAL STORAGE AND CONTROL

8.1 POLICY

All materials and supplies in storage will have the necessary protection to preclude deterioration, corrosion, or damage during storage life and will carry identification sufficiently clear to ensure that only those materials specified by process instructions will be withdrawn from material storage and issued for processing.

Only analytical grade chemicals and reagents, bearing such grade identification will be utilized by the Laboratory. Each container will be assigned a unique identification number upon receipt. The date of receipt will be posted on each container. The use and the retention (shelf life) of such chemical will be monitored by the Laboratory Supervisor.

All standards used by the Laboratory must be NIST certified. Each standard must be accompanied with a certificate showing the name, composition, concentration, reference number and NIST Certification. The use and distribution of these standards will be monitored by the LIMS. The certificate and certification documents of standards will be controlled by the QA department.

8.2 RESPONSIBILITY

Only authorized personnel will have access to, and the responsibility for, control and issue of materials or supplies. Materials and supplies will be stored to allow for ready identification. Care will be taken to preclude mixing of rejected material and supplies with those that are qualified for issue.

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9.0 CONTROL OF PROCESS

9.1 STANDARD PRACTICES

Standard practices applicable to services provided by the Oak Ridge Laboratory are contained in documented procedures and this Q.A. Program Manual. Every effort is made to implement and fulfill the requirements of Federal and local laws, rules, guidance(s), and directives as may be applicable to the operational practices within the Oak Ridge Laboratory. These may include but are not limited to:

9.1.1 Federal and State rules and regulations.

9.1.2 Consensus standards related to the services performed (e.g., American National Standards Institute).

9.1.3 Regulatory Guides published by the Nuclear Regulatory Commission, Department of Energy, the Environmental Protection Agency, and the Department of Defense.

9.1.4 Specific contractual agreements with clients.

9.1.5 Where conflicts may occur among any of the above items, the client will be notified and requested to specify the practice to be followed.

9.2 DOCUMENTED PROCEDURES

Routine analytical operating procedures are documented. Each laboratory procedure includes quality control criteria that are applicable to that process. The laboratory management will develop, promulgate, and implement procedures that document the operations performed in the laboratory. Additionally, the following general pr ocedures or documents, as applicable, will be developed:

9.2.1 Quality Assurance Procedures

9.2.2 Radiation Safety Manual and Procedures

9.2.3 Sample Control Procedures

9.2.4 Purchasing Policies and Procedures

9.2.5 Data Review Procedures

9.2.6 Environmental Compliance Procedures

9.2.7 Safety Procedures

9.2.8 Chemical Hygiene Plan

9.2.9 Hazard Communications Program

9.2.10 LIMS Procedures

9.2.11 Management Procedures

9.2.12 Analytical Procedures

9.3 RESPONSIBILITY

The Laboratory Manager, or designated representative, determines which instructions or procedures require quantitativ e or qualitative acceptance criteria and specify the appropriate criteria on special contracts or projects.

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9.4 WORK POLICY

All work to be performed by the Oak Ridge Laboratory on client samples is authorized by the client and controlled through a Laboratory I nformation Management System (LIMS) work order document which incorporates the client's requirements. (Or by some other document deemed necessary by the Laboratory Manager or Project Manager as directed by the customer)

9.4.1 The work order specifies those analy ses necessary to assure compliance with contractual obligations.

9.4.2 The Project Manager or designated personnel under the authority of the Laboratory Manager, are responsible for notifying the Q.A. Manager and performing laboratory departments, through the appropriate supervisor, of all contract requirements including reporting format and quality control criteria. This may be done by reference to other documents (e.g., Purchase Order, statement of work, technical specifications, etc.) that delineates the contract requirements.

9.4.3 The Pro ject Manager or designee under the authority of the Laboratory Manager -, will ensure planning, scheduling, and resources are considered when contracting for or accepting work.

9.4.4 When subcontracting analytical services, the Project Manager or designated individual under the authority of the Laboratory manager-, will assure that:

- The client is notified in writing of the intention to subcontract any portion of the testing to another party.
- If the work is covered under NELAP, the work will be placed with a laboratory accredited under NELAP for the tests to be performed.
- Records, demonstrating that the above requirements have been met, are retained in the project folder.

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10.0 PREVENTIVE MAINTENANCE

10.1 POLICY

Preventive maintenance is performed as required on instrumentation and equipment to prevent down time and to ensure reliable performance. The laboratories maintain instrument redundancy that precludes the requirement for a repair and maintenance capability for instrumentation. Maintenance and/or repair of equipment are performed by the equipment manufacturer or authorized representative under contract or purchase order.

10.2 MAINTENANCE

Preventive maintenance procedures will be developed for use where instructions are not provided in the manufacturer supplied operator's manual. As applicable, each department will maintain a major equipment and measurement standards list. A record of instrument maintenance, calibration, and repair, if applicable, will also be maintained. The sup ervisors and operating personnel are responsible for complying with the department maintenance schedule.

10.3 SPARE PARTS

Supervisors will ensure that an adequate inventory of spare parts and consumables is requisitioned and maintained for instrumentation in their area in order to prevent down time or compromise operating conditions.

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11.0 CONTROL OF MEASUREMENT AND TEST EQUIPMENT

11.1 MEASUREMENT AND TEST EQUIPMENT CALIBRATION POLICY

This section establishes the controls and calibration requirements for all analyti cal and nuclear measurement equipment. An equipment list will be maintained indicating calibration status.

11.1.1 All equipment whose operation and function directly affect the quality of service will be inspected/calibrated at established intervals. As applicable, equipment will be suitably identified to reflect calibration status. If an instrument is determined to be out-of-tolerance, it will be segregated, or otherwise clearly identified as inoperable. Records of each calibration will be kept in appropriate logbooks or files. Instruments whose calibrations are performed during method operations are calibrated and controlled in accordance with the method requirements. Run logs will be maintained for this category of instrumentation.

11.1.2 The equipment used to determine the quality characteristics and accuracy of instruments will be checked and verified either internally (dependent upon capability), or by qualified calibration services.

11.1.3 Frequency of inspection/calibration will be based on use of the equipment or instrument, environmental conditions in which it is used, its inherent stability, manufacturer's recommendation, and the wear or deterioration resulting from its use.

11.1.4 Certified standards are used for all primary calibrations. National Institute of Standards and Technology (NIST) or NIST traceable, Environmental Protection Agency (EPA), New Brunswick Laboratory (NBL), or Department of Energy (DOE) standards are used, when available, for the primary calibrations or verification of primary calibrations.

11.1.5 All p reparations of standard solutions are recorded in a standards preparation logbook or file. Identities of standards are such that a secondary standard or dilution can be traced, through subsequent actions, back to the initial certification. Records of thes e reference standards are organized in a secure location in the QA office.

11.1.6 Quality control check standards are used to record instrument sensitivity and linearity and to verify proper response. Methods and calibration entries are dated, initialed, and documented by the analyst.

11.1.7 Measuring and test equipment are tagged as to calibration or operating status for periodic processes performed on a scheduled interval of greater than one month. For processes performed more frequently, separate documentation will be available for verification of operational status. Instruments that are too small to be tagged or are subject to a wide variety of calibrations shall have separate documentation of status available.

11.2 RESPONSIBILITY

Testing and/or calibration of equipment and instruments will be performed under the direction of the supervisor, the department manager, or the operations manager and performed under suitable environmental conditions.

11.3 PROCEDURES

All tests and calibrations will be performed in accordance with written procedures that contain provisions for ensuring that all prerequisites for the given test have been met, including appropriate equipment to be used.

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11.4 CERTIFICATION AND CERTIFICATES OF CALIBRATION

11.4.1 To the extent possible, calibration will be traceable to NIST. Records of traceability will be maintained along with records of routine calibrations of each instrument or measurement system. Where no NIST traceability exists, the basis used for calibration will be documented.

11.4.2 Equipment records will be main tained to indicate past and current status, and to provide reproducibility and traceability of results.

11.5 RADIOACTIVE SOURCE CALIBRATION

Radioactive sources used as calibration standards will be periodically calibrated and controlled. Current calibration certificates will be kept on file.

11.6 CALIBRATION RECORDS

Supervisors will ensure that calibration data for instruments and radioactive sources is recorded in the instrument logbook, on data work sheets, on computer files and/or control charts. When required, new calibration charts will be prepared when there is measurable change in calibration effect on instruments that have been calibrated. If an instrument is determined to be out of tolerance, it will be segregated or otherwise clearly tagged as inoperable and not used until repaired.

11.7 REPORTS GENERATED FROM USE OF A DEFICIENT INSTRUMENT

If a major deficiency in an instrument or device is detected during periodic calibration procedures, the technician will immediately notify the supervisor, the operations m anager, and the Q.A. Manager. A conference will immediately be scheduled to investigate and decide what corrective action is to be taken on past data and reports resulting from the use of the deficient instrument or device. A record of corrective actions will be maintained.

11.8 PERFORMANCE CHECKS OF RADIATION SCREENING INSTRUMENTS

Performance checks will be made to ensure the continuing capability of radiation screening instruments. Procedures will include efficiency checks and background determinations. Th e procedure and frequency of each check is optimized for each detector system to provide assurance of the detector's performance. Documentation of the checks and the results are kept for all operations.

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12.0 DATA REDUCTION, VERIFICATION, AND REPORTING

12.1 USE OF COMPUTER HARDWARE AND SOFTWARE

Computer programs used in the production or support of client data are either purchased, or developed using approved development methodology. Such programs are independently validated, verified, and documented. Changes are controlled to assess the potential impact of the change on the performance of the program.

12.2 DATA REDUCTION AND VERIFICATION

Sample receipt and distribution through the laboratory is documented by the sample receiving technician. Sample handling, subsampling, and preparation for counting measurement are documented by the laboratory technicians.

12.2.1 The successful completion of an analysis is monitored by the Counting Room staff. The Laboratory Manager, or designated individual, performs the final review and approves the data.

12.2.2 Calculation methods, transcriptions, and data flow, plus times and locations of the various tiers of review are detailed in the specific procedure.

12.3 REPORTING

The Project Manager or designated individual is responsible for providing the client with the required analytical results. Reports to clients will be reviewed for accuracy and completeness and, where required, analytical methods and minimum/method detection limits (MDL) will be reported. Laboratory reports of analyses will be signed by an authorized individual who, along with the person who signed the data sheets, can attest to the fact that the data was generated in accordance with established procedures.

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13.0 DOCUMENT CONTROL

13.1 POLICY

The primary formal communication methods within the Oak Ridge Laboratory departments are documents that inform or direct activities affecting purchasing, sample analyses and report ing, instrument calibration and/or testing, radiation controls , proper handling of wastes, radiation safety, and Health and Safety. These documents are controlled by the Q.A. Program Manual, Operating Procedure Manuals, other documented procedures, or by interoffice memoranda. Drawings and specifications are not controlled as separate documents but are included in controlled procedures where applicable. The QA Office controls logbooks used to document the analysis of samples (see MP-023, Documentation of Analytical Laboratory Notebooks).

13.2 RESPONSIBILITY

13.2.1 The Q.A. Manager is primarily responsible for maintaining files of all controlled documents and will:

- Review the Quality Assurance Program Manual and provide recommendations for updating.
- Ensure that all holders of controlled documents receive updates to the documents.
- Maintain files of controlled document distribution indicating document title, number, revision number, assigned date, and the name of the individual to whom the document is assigned.
- Forward revisions of controlled documents to assigned individuals. An acknowledgment form will accompany each document revision for verification of receipt and to provide disposition instructions for the superseded pages
- Maintain a Master List o f current procedures which includes procedure number, procedure title, current revision number, and date on which the current revision became effective. The list will be continually updated to reflect all new revisions or new procedures issued. An electronic copy of this list shall be available for employee reference at all times.

13.2.2 Uncontrolled copies of controlled documents will be distributed only if marked "Uncontrolled."

13.2.3 Superseded and/or obsolete documents are isolated from use or destroyed. Upon training to new revisions, employee s sign to verify the destruction of all uncontrolled copies of obsolete revisions.

13.2.4 Each employee is responsible for requesting revisions or changes to operating procedures for their area of responsibility.

13.2.5 The Q.A. Manag er will be advised of any changes in procedures required to satisfy client specific requirements.

13.2.6 Client information and records such as contract requirements, project descriptions, analytical data and results submitted to the client; and all laboratory re cords associated with such submittal will be maintained by the laboratory for a minimum of 5 (Five) years. Clients will be contacted and queried for disposition instructions for their related documentation

13.2.7 If or when the laboratory may transfer ownership, is decommissioned, or goes out of business, ALL clients will be notified and asked to provide specific direction regarding the transfer or disposition of documents and records related to their project(s)

14.0 INTERNAL QUALITY CONTROL

14.1 LABORATORY ANALYTICAL SERVICES

Precautions are taken in the chemistry laboratories to avoid cross-contamination of samples and to ensure the reporting of accurate results. Quality control samples are analyzed along with routine samples to indicate when results may be in error due to improper operation or calibration of equipment, inadequate training of personnel, a deficiency in the procedure, or cross-contamination from other samples.

14.1.1 Laboratory Precision - Laboratory management personnel are responsible to ensure that analytical results are reproduced internally within acceptable limits.

14.1.2 Precision and Accuracy - Replicate standards and/or samples are used to estimate the precision of each analytical test procedure for a known matrix. Data control limits are established to satisfy the requirements of specific measurements based on prior knowledge of the measurement system and method validation studies. Certified standards and/or spiked samples are used to estimate chemical recovery and accuracy for these procedures for known matrices.

14.1.3 Calibration and Performance Checks of Nuclear Measurement Systems - Reference standards are used for calibrating nuclear measurement systems. In addition to calibration of all instrumentation, routine monitoring is performed to ensure the continuing integrity of the instrument performance. The monitoring parameters performed include efficiency checks, background determinations, and energy calibrations. The procedure and frequency of each check is optimized for each detector system to provide assurance of the detector's performance. Documentation of the checks and the results are kept for all systems. The supervisor is responsible for these calibration and performance checks.

14.1.4 Duplicate Analysis - Duplicate aliquots of randomly selected samples will be processed on a routine basis. The analyst will always process samples in accordance within approved operating procedures. The evaluation of the duplicate analysis will be based on examination of the difference between the duplicates. A stat istical analysis of the data may be performed when a cursory evaluation indicates problems with the results. If the two results agree with in the three standard deviation limits, a more detailed evaluation will generally not be necessary. Results of duplica te analyses will be included in the monthly Q.C./Q.A. report.

14.1.5 Detection and Elimination of Bias - Where possible, calibration will be with standards that are traceable to NIST. However, traceability to NIST is not always possible and reliance on other su ppliers may be necessary (e.g., International Atomic Energy Agency, U.S. Department of Energy, U.S. Environmental Protection Agency, or commercial supplier such as Analytics, Amersham Biosciences, AEA Technology, etc.). Standards in the appropriate geometry or form will be used to determine efficiency of instruments on a periodic basis. In the calibration process, the ideal standard will be a known quantity of the radionuclide to be measured, prepared in exactly the same geometry as the samples and counted under the same conditions. In this way, factors such as self -absorption, backscatter, sample geometry, and detector efficiency will be accounted for empirically.

14.1.6 Spiked Samples - A known quantity of calibrated radioactive standard solution will be added to an aliquot of the sample or to a "blank" sample for replicate analysis. When the entire analytical system is operating properly, the laboratory record will demon strate the accuracy and precision of the data. Divergent data from the spiked sample will point out

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problem areas. If the data is consistently higher or lower than the known value, bias in the analytical procedure is indicated. This may require a search f or personnel errors, re-standardization of carriers or tracers, and/or recalibration of counting equipment..

14.1.7 Background Determination - The type of equipment and environmental factors contribute to variation in the counting rate of instrument background. The background of each system instrument will be determined and recorded with sufficient frequency to provide a firm statistical basis for that measurement and to ensure response to potential instrument problems or other artifacts such as controlled contamination.

14.1.8 These background determinations will include use of the items that most closely duplicate the analytical configuration in type, geometry, and with any associated fixtures. In some cases, true blanks are not available, but the closest practicable analog is used.

14.1.9 Some systems are sufficiently stable to require no change in backgrounds used for data reduction (e.g., uranium daughter gamma-rays found in gamma spectra due to adjacent building materials and earth). In this case, backgrounds will be compa red to historical data to insure sufficient stability. Other systems experience enough variability to require computed backgrounds based upon running averages.

14.1.10 Background data will be recorded in the logbook or computer file for that specific instrument along with calibration data and instrument maintenance records.

14.1.11 Blanks - Blank samples are routinely analyzed to verify control of contamination and process. Results of processed blanks will be included in the monthly Q.C./Q.A. report.

14.1.12 Collaborative Testing - The Oak Ridge Laboratory participates in collaborative testing or inter-laboratory comparison programs. Natural or synthetic samples prepared to contain known concentrations of certain radionuclides are sent to participating laboratories by an independent referee group such as the DOE Radiological and Environmental Sciences Laboratory DOE, Idaho Falls, Idaho (MAPEP); by a NELAC approved provider such as the Environmental Resources Agency (ERA), Environmental Measurements Laboratory (EML), or by customer(s).

These programs enable Oak Ridge Laboratory personnel to document the precision and accuracy of radioactivity measurements, identify instrumental and procedural problems, and compare performance with other laboratories.

14.2 QUALITY CONTROL AND DATA REPORTS

14.2.1 Quality Control Reports

Quality control results will be summarized, and include with every sample/group of samples.

14.2.2 Data Reports

Routine performance requires documentation of all pertinent information with the basic documents dated and initialed or signed. Required documentation will be the initial work order, Chain-of-Custody (CoC), or document that records all pertinent information such as the identity of the sample and analyses to be performed. The data report will include technic al analysis notes, logbooks, work sheets all raw data and other information used in performing the analysis. The report of analysis will be the final report of the data to the client and is issued in accordance with the laboratory's procedure for review and processing, as well as any client specific requirements.

14.3 DATA VERIFICATION

Routine performance requires inclusion of all pertinent information with basic documents dated and initialed or signed. The work order has recorded such information as the ident ity of the samples and analyses to be performed. All raw data and other information used in performing the

analyses are documented.

14.3.1 Electronic Deliverables Verification - Project managers, or designated individuals, are responsible for ensuring that electronic deliverables are complete and accurate.

14.4 Sample Custody

Samples are assigned a unique laboratory identification number, marked on a label that is applied directly t o the container and which identifies the work order and laboratory fraction. Sample control personnel are designated sample custodians for strict (legally defensible) CoC samples. Locked buildings, refrigerators, freezers, and cabinets are available for Co C samples. Sample custody forms or technician analysis notes are used for tracking all samples through the analytical process. Details for radiological survey of samples, sample security, sample disposal, etc. are outlined in approved Sample Control Procedures. Sample chemistry and nuclear counting requirements are assigned by the laboratory manager, or designated individuals.

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15.0 AUDITS

15.1 POLICY

The Oak Ridge Laboratory has established a comprehensive system of planned and documented audits to verify compliance with all aspects of the Q.A. Program. An audit is defined as a documented activity performed in accordance with written procedures or checklists to verify, by examination and evaluation of objective evidence, that applicable elements of the Q.A. Program have been developed and effectively implemented in accordance with specific requirements. Audits will be performed by persons not having direct responsibility for those areas being audited.

15.1.1 Customer Access to the Oak Ridge Laboratory Facilities and Personnel - The client is frequently responsible for auditing the Oak Ridge Laboratory's performance relative to contractual requirements. The exact nature of this responsibility is relative to the nature of the regulatory or licensing requirements, the significance of the services, and the technical expertise available or inherent within the client's organization. The need for, and frequency of, client audits is dependent upon the above factors. A client may authorize an independent agency to perform an audit on its behalf. When possible, the facilities, equipment, and records (proprietary information excluded) of the Oak Ridge Laboratory will be made available for client inspection along with the necessary personnel to permit verification of quality characteristics.

15.1.2 The Q.A. Manager will coordinate and participate in audits conducted by the client or the client's representative.

15.1.3 Internal Audits - The Q.A. Manager will audit the laboratory operations to verify compliance with established procedures and requirements set forth in the Q.A. Program Manual. Use of a checklist will insure items in compliance are noted as well as any requirements for improvement.

15.1.4 External Audits - External audits of organizations providing services to the Analytical Services Group are scheduled at a frequency commensurate with the status and importance of the activity.

15.2 RESPONSIBILITY

Audits will be directed by the Q.A. Manager with assistance from designated personnel.

15.2.1 The Q.A. Manager will be responsible for an independent quality assurance audit of each department.

15.2.2 The Q.A. Manager will be responsible for assuring that audits are performed by knowledgeable professionals.

15.2.3 An independent qualified auditor will audit areas of responsibility assigned to the Q.A. Manager.

15.3 DOCUMENTATION

Audit results will be documented by the Q.A. Manager.

15.3.1 The Laboratory Manager shall be provided a copy of the audit report.

15.3.2 The QA Manager will determine if there are any corrective actions required and the individual responsible for implementing the corrective action

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15.4 DEFICIENT AREAS

15.4.1 The responsible Manager will ensure correction of the identified deficiencies.

15.4.2 The Q.A. Manager will verify that action is taken to correct any deficiency and will take follow-up action to ensure that corrections have been completed.

15.4.3 The Q.A. Manager will ensure close out, with documentation, of the audit after corrective actions have been completed.

15.4.4 For uncorrected or unresolved deficiencies, after due diligence, the Q.A. Manager will petition the Laboratory Manager to bring to bear his authority for resolution of the deficiencies.

15.5 FREQUENCY OF AUDITS

The Q.A. Manager will ensure internal audits are conducted on an annual basis. Additional selective audits will be conducted when one or more of the following conditions exist:

15.5.1 When significant changes are made in functional areas of the Q.A. Program, including significant reorganization or procedure revisions.

15.5.2 When assessment of the Program's effectiveness is considered necessary.

16.0 QUALITY ASSURANCE AND INSPECTION RECORDS

16.1 POLICY

Records that provide objective evidence of the quality of work are generated and maintained. These records include controlled logbooks, customer instructions, sample analyses data sheets, and results of reviews, inspections, tests, audits, corrective actio ns, reports, and training records. Also included are related data such as personnel qualifications, procedures, and equipment records.

16.2 RESPONSIBILITY

The responsibility for initiation, completeness, and reliability of Q.A. records is vested in the appro priate supervisor, with periodic verification checks by the Q.A. Manager. All Oak Ridge Laboratory personnel performing processes or services associated with the work being performed will assist in the efforts.

16.3 RECORDS

16.3.1 Inspection and test records will, at a minimum, identify the inspector or data recorder, the type of observation, the results, the action taken in connection with any deficiencies noted, and the date of the inspection or test.

16.3.2 All required records will be legible and of a quality that can be copied. Records shall be completed using reproducible ink. Errors or incorrect entries will be lined through with a single line, dated, and initialed by the recorder.

16.3.3 Correspondence from clients may be made available for inspection at the discretion of client representatives and authorization from the originating organization.

16.3.4 Q.A. records will be identified and controlled by customer number and/or client identification as applicable.

16.4 STORAGE OF RECORDS

16.4.1 Quality assurance records will be firmly attached in binders, placed in folders or

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envelopes, and, if applicable, cross referenced by client identification and stored in a secure area.

16.4.2 Q.A. records will be properly stored and made available to the client upon request.

16.4.3 Records will be maintained in a secured and protective storage area.

16.4.4 Records will be identified and be retrievable.

16.4.5 CoC records are included with the sample set records.

16.4.6 Longer retention or duplication of records is available at the specific direction from the client.

16.4.7 Laboratory management will be responsible for governing access to, and controlling the records.

16.4.8 Analytical reports and source calibration data will be retained for a minimum of five years after results are reported to the client.

16.4.9 Procurement records will be retained for a minimum of five years or as required by the contract.

16.4.10 All records and analyses performed pertaining to (NELAC) accreditation will be kept for a minimum of 5 years and would be available for inspection by the accrediting authorities during this period even without prior notification to the laboratory.

17.0 CORRECTIVE ACTION

17.1 POLICY

The Oak Ridge Laboratory policy is to ensure continuous acceptabl e quality levels for services provided. Conditions adverse to quality will be identified and corrected as soon as practical.

17.2 CORRECTIONS

17.2.1 CORRECTIVE ACTION REPORT (CAR)

In the case of a significant condition adverse to quality, the cause of the condition shall be determined and corrective action taken to preclude recurrence. The identification, cause, and corrective action shall be documented and reported to appropriate levels of management. Follow-up action shall be taken to verify implementation of this corrective action and documented via a Corrective Action Follow -Up form. The Corrective Action Report (CAR) Form shall be used to document this condition. Typically, the Q.A. Manager will initiate investigation and corrective action by issuing a Corrective Action Report (CAR) in any of the following situations:

- When an audit reveals circumstances that will adversely affect quality (Audit Finding) as determined by the Q.A. Manager.
- When any results of an inter-comparison study are out of control, or for non-participation.
- When procedural or technical problems arise and the Q.A. Manager determines that they will significantly affect quality.

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17.3 NON-CONFORMANCE REPORT (NCR)

A non-conformance is a deficiency in a characteristic, procedure, or documentation that renders the quality of an item unacceptable, however, is not considered a significant condition that would require an investigation by use of a CAR. In the laboratory,non-conformances can include physical defects, incorrect or inadequate documentation, and deviations from an established protocol, plan, or documented technical requirement. This condition is documented using a Non-Conformance Report (NCR) Form.

17.4 RESPONSIBILITY

All laboratory personnel are responsible to communicate any evidence of unacceptable quality performance to their supervisor, the responsible manager, and/or the Q.A. Manager.

17.4.1 The responsible manager will ensure investigation of a condition adverse to quality, determine assignable cause, and provide recommendation(s) for corrective action.

17.4.2 The responsible manager will ensure action is initiated to correct the assignable cause of the adverse condition and to determine and initiate the specific corrective action(s) necessary to preclude recurrence.

17.4.3 The Q.A. Manager will review CARs, NCRs, and routine Q.C. reports for evidence of unacceptable quality.

17.4.4 Copies of the completed CARs and NCRs will be kept on file by the Q.A. Manager.

17.5 CLIENT NOTIFICATION

The client will be notified when any Corrective Action is initiated due to evidence of unacceptable quality that is related to their contract.

18.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

18.1 POLICY

The Oak Ridge Laboratory policy is to keep management apprised of all quality assurance problems, actions taken to correct them, and any actions taken to prevent recurrence.

18.2 QUALITY ASSURANCE REPORTS

18.2.1 Quality Assurance Reports are prepared quarterly by the QA Manager and submitted to upper management. The reports shall in clude discussion of inter-comparison studies, status of corrective actions, and quarterly QA objectives

18.2.2 The Q.A. Manager will report all general or system audit results, problems, corrective actions, and replies.

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Document Revision History

Revision	Effective Date	Changes From Previous Revision
7	8/1/13	· Document Revision History table implemented · Added Emergency Coordinator to title designations of positions in Section 1.4.4 · Updated list of accreditations in section 1.9 to reflect all current certifications · Updated Laboratory Organization Chart · Removed requirement for employees to maintain hard copies of procedures in work area.

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PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

Eberline Ananlytical – Oak Ridge Laboratory

601 Scarboro Road, Oak Ridge, TN 37830-7371

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 "General Requirements for the competence of Testing and Calibration Laboratories" and the DoD Quality Systems Manual for Environmental Laboratories Version 4.2 10/26/2010 and is accredited is accordance with the:

United States Department of Defense
Environmental Laboratory Accreditation Program
(DoD-ELAP)

This accreditation demonstrates technical competence for the defined scope:

Environmental Testing

(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body's duty to observe and comply with the said rules.

For PJLA:

Initial Accreditation Date:	*Issue Date:*	*Accreditation No.:*	*Certificate No.:*
December 18, 2012	December 18, 2012	70747	L12-194

Tracy Szerszen
President/Operations Manager

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjlabs.com

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Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

Eberline Analytical – Oak Ridge Laboratory

601 Scarboro Road, Oak Ridge, TN 37830-7371
Michael McDougall Phone: 865-481-0683

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Air/Aqueous	Eberline SOP EiChroM AM-01	Alpha Spectroscopy	Isotopic Curium
Air/Aqueous/Solid	AP-016	Beta GPC	Chlorine-36
Air/Aqueous/Solid	AP-026	Beta LSC	Carbon-14
Air/Aqueous/Solid	ASTM D-5174	KPA	Total Uranium
Air/Aqueous/Solid	Eberline SOP EiChroM Ni-01 Beta	L SC	Nickel-63
Air/Aqueous/Solid	Eberline SOP EML Pu-01	Alpha Spectroscopy	Isotopic Plutonium
Air/Aqueous/Solid	Eberline SOP EML Th-01	Alpha Spectroscopy	Isotopic Thorium
Air/Aqueous/Solid	Eberline SOP EPA 903.0	Alpha Spectroscopy	Radium-226
Air/Aqueous/Solid	EiChroM Np-01	Alpha Spectroscopy	Neptunium-237
Air/Aqueous/Solid	EiChroM Sr-01	Beta GPC	Strontium-90
Air/Aqueous/Solid	EiChroM Sr-01	Beta GPC	Total Strontium
Air/Aqueous/Solid	EiChroM Tc-01	Beta LSC	Technetium-99
Air/Solid	Eberline SOP EiChroM AM-01	Alpha Spectroscopy	Americium-241
Air/Solid	Eberline SOP EML Pb-01	Beta GPC	Lead-210
Air/Solid	Eberline SOP EML Po-01	Alpha Spectroscopy	Polonium-210
Air/Solid	Eberline SOP EML U-02	Alpha Spectroscopy	Isotopic Uranium
Air/Solid	Eberline SOP EPA 903.0	Alpha GPC	Total Radium
Air/Solid	Eberline SOP EPA 904.0	Beta GPC	Radium-228
Air/Solid	LANL ER-130	Gamma Spectroscopy	Gamma Emi tting Radionuclides
Aqueous	EPA 900.0	Alpha Beta GPC	Gross Alpha & Beta
Aqueous	EPA 901.1	Gamma Spectroscopy	Gamma Emitting Radionuclides
Aqueous	EPA 903.0	Alpha GPC	Total Radium
Aqueous	EPA 904.0	Beta GPC	Radium-228
Aqueous	EPA 906.0	Beta LSC	Tritium
Aqueous	EPA 908.0	Alpha Spectroscopy	Isotopic Urani um
Aqueous/Solid	EiChromM Am-01	Alpha Spectroscopy	Am ericium-241
Solid	EiChromM Am-01	Alpha Spectroscopy	Isotopic C urium

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Perry Johnson Laboratory Accreditation, Inc.

PJLA

October 1, 2012

Mr. Michael McDougall
Eberline Analytical – Oak Ridge Laboratory
601 Scarboro Road
Oak Ridge, TN 37830-7371

Dear Mr. McDougall:

This letter is to confirm that you have successfully completed your accreditation assessment. A certificate has now been granted and posted on our website. As you are aware, PJLA will no longer be issuing expiration dates on our certificates. Your certificate # **L12-194** will remain valid as long as you continue to maintain your annual assessments and reaccreditation assessments as stated in your customer agreement with PJLA. At this time, we have confirmed that your annual assessments will be conducted during the month of **June** each calendar year. This will include an interim surveillance assessment and a full system reassessment to be completed by **June 2014** . Once your reassessment is conducted and approved by our accreditation committee a revised status letter will be provided to you. Please allow PJLA at least 120 days from your assessment due date to issue this letter.

Please feel free to release this letter to any interested parties as confirmation of your certificate validity. Also, please remind them that your certificate is posted on our website at all times. Any changes in regards to your accreditation status will be reflected on our website.

We would like to thank you for your patronage and we look forward to continuously serving your accreditation needs in the future. If we can assist you any further, please feel free to contact us at any time.

Sincerely,

Tracy Szerszen
President/Operations Manager

755 W. Big Beaver Rd. · Suite 1325 · Troy, MI 48084 · Phone: 1-877-369-LABS or 248-519-2603 · Fax: 248-213-0737

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State of New Jersey
Department of Environmental Protection

Certifies That

Eberline Services - Oak Ridge

Laboratory Certification ID # TN004

is hereby approved as a

Nationally Accredited Environmental Laboratory

to perform the analyses as indicated on the Annual Certified Parameter List which must accompany this certificate to be valid

having duly met the requirements of the

Regulations Governing The Certification Of Laboratories And Environmental Measurements N.J.A.C. 7:18 et. seq.

and

having been found compliant with the 2009 TNI Standard approved by the

The NELAC Institute

Expiration Date June 30, 2014

Joseph F. Aiello, Manager
Office of Quality Assurance

NJDEP is a NELAP Recognized Accreditation Body

This certificate is to be conspicuously displayed at the laboratory with the annual certified parameter list in a location on the premises visible to the public. Consumers are urged to verify the laboratory's current accreditation status with the State of NJ, NELAP.

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New Jersey Department of Environmental Protection
Environmental Laboratory Certification Program

LABORATORY PERSONNEL LIST

Effective as of: 07/01/2013

Laboratory Name: EBERLINE SERVICES - OAK RIDGE Laboratory Number: TN004 Activity ID: NLC130001
601 SCARBORO RD
OAK RIDGE, TN 37830

Position: Lead Tech. Director

Employee	Category/Instrument	Start Date	End Date	Documentation Status	Complete Date	Comments
AHMED HALOUMA		7/1/2005	7/31/2012	Complete/Qualified		
MIKE McDOUGALL		7/31/2012		Complete/Qualified		

Position: QA Officer

Employee	Category/Instrument	Start Date	End Date	Documentation Status	Complete Date	Comments
SABA ARNOLD		7/31/2012		Complete/Qualified		
AHMED HALOUMA		4/16/2002	7/31/2012	Complete/Qualified		

Position: Supervisor/Tech Dir

Employee	Category/Instrument	Start Date	End Date	Documentation Status	Complete Date	Comments
AHMED HALOUMA	SDW07, 08, WPP09 or 10	7/1/2005	7/31/2012	Complete/Qualified		
MARY TURNER	SDW07, 08, WPP09 or 10	7/31/2012		Complete/Qualified		

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New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2013 until 06/30/2014

Laboratory Name: EBERLINE SERVICES - OAK RIDGE Laboratory Number: TN004 Activity ID: NLC130001
601 SCARBORO RD
OAK RIDGE, TN 37830

Category: SDW07 -- Radiochem.: Radioactivity / Radionuclide

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	UT	SDW07.01000	DW	Proportional or Scintillation	[EPA 900.0]	Gross - alpha-beta
Certified	Yes	UT	SDW07.03100	DW	Gamma Spectrometry	[EPA 901.1]	Gamma emitters
Certified	Yes	UT	SDW07.03900	DW	Radiochemical	[EPA 903.0]	Radium - 226
Certified	Yes	UT	SDW07.04100	DW	Precipitation	[EPA 904.0]	Radium - 228
Certified	Yes	UT	SDW07.05000	DW	Precipitation	[EPA 903.0]	Radium - total
Certified	Yes	UT	SDW07.06000	DW	Total Sr & Strontium 90	[EPA 905.0]	Strontium - 89, 90
Certified	Yes	UT	SDW07.06010	DW	Strontium 90	[EPA 905.0]	Strontium - 90
Certified	Yes	UT	SDW07.07000	DW	Distillation/Liquid Scintillation	[EPA 906.0]	Tritium
Certified	Yes	UT	SDW07.08100	DW	Co-Precipition	[EPA 908.0]	Uranium
Certified	Yes	UT	SDW07.08400	DW	Radiochemical / Alpha Counting	[EPA 907.0]	Uranium
Certified	Yes	UT	SDW07.09000	DW	Radiochemical / Alpha Counting	[EPA 907.0]	Plutonium

Category: WPP09 -- Radiochem.: Radioactivity / Radionuclide

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	UT	WPP09.01000	NPW	Proportional or Scintillation	[EPA 900.0]	Gross - alpha
Certified	Yes	UT	WPP09.03000	NPW	Proportional Counter	[EPA 900.0]	Gross - beta
Certified	Yes	UT	WPP09.05000	NPW	Precipitation	[EPA 903.0]	Radium - total
Certified	Yes	UT	WPP09.05010	NPW	Proportional	[EPA 903.0]	Radium - 226
Certified	Yes	UT	WPP09.06020	NPW	Co-Precipitation / Beta Counting	[EPA 904.0]	Radium - 228
Certified	Yes	UT	WPP09.07000	NPW	Gamma Spectrometry	[EPA 901.1]	Photon Emitters
Certified	Yes	UT	WPP09.08000	NPW	Precipitation / Beta Counting	[EPA 905.0]	Strontium - 89, 90
Certified	Yes	UT	WPP09.08100	NPW	Precipitation / Beta Counting	[EPA 905.0]	Strontium - 90

Category: SHW09 -- Miscellaneous Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	UT	SHW09.60000	NPW, SCM	Proportional Counter	[SW-846 9310]	Gross - alpha-beta
Certified	Yes	UT	SHW09.60100	NPW, SCM	Precipitation	[SW-846 9315]	Alpha Emitting Radium Isotopes

KEY: AE = Air and Emissions, BT = Biological Tissues, DW = Drinking Water, NPW = Non-Potable Water, SCM = Solid and Chemical Materials

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

Office of Quality Assurance
401 East State Street
P.O. Box 420, Mail Code 401-02D
Trenton, New Jersey 08625-0420
Telephone: (609) 292-3950
Facsimile: (609) 777-1774

BOB MARTIN
Commissioner

Dear Laboratory Manager:

A Certificate and an Annual Certified Parameter List (ACPL) that reflects the current status of your facility are enclosed. If there are any discrepancies, please contact your Laboratory Certification Officer to verify information and make arrangements for a new ACPL. Effective with the receipt of this letter, your facility's certification status is valid through June 30, 2014. Both the ACPL and Certificate should be conspicuously displayed at your facility in a location on the premises that is visible to the public.

As always, we are available to discuss any comments or questions. Please do not hesitate to contact your Laboratory Certification Officer or me.

Sincerely,

Joseph F. Aiello, Manager

Enclosure(s)

WLLFOIA4312 - 015 - 0168385

WLLFOIA4312 - 015 - 0168386

New Jersey Department of Environmental Protection

National Environmental Laboratory Accreditation Program

ANNUAL CERTIFIED PARAMETER LIST AND CURRENT STATUS

Effective as of 07/01/2013 until 06/30/2014

Laboratory Name: EBERLINE SERVICES - OAK RIDGE Laboratory Number: TN004 Activity ID: NLC130001
601 SCARBORO RD
OAK RIDGE, TN 37830

Category: SHW09 -- Miscellaneous Parameters

Status	Eligible to Report NJ Data	State	Code	Matrix	Technique Description	Approved Method	Parameter Description
Certified	Yes	UT	SHW09.60110	NPW, SCM	Precipitation	[SW-846 9320]	Radium - 228

Joseph F. Aiello, Manager

KEY: AE = Air and Emissions, BT = Biological Tissues, DW = Drinking Water, NPW = Non-Potable Water, SCM = Solid and Chemical Materials

D H E C
PROMOTE PROTECT PROSPER

Catherine B. Templeton, Director
Promoting and protecting the health of the public and the environment

September 19, 2012

MICHAEL MCDOUGALL
EBERLINE SERVICES OAK RIDGE LAB
601 SCARBORO RD
OAK RIDGE, TENNESSEE 37830

Laboratory I. D. 84013

Dear Michael Mcdougall:

Your amended certificate and associated parameter list(s) are enclosed. These documents now represent the certificate of record for your laboratory. Any certificate(s) and associated parameter list(s) received prior to your receipt of these documents are now null and void and should be destroyed. Please be reminded that all environmental data submitted to the Department is reviewed to ensure that the reporting laboratory possesses the necessary certification. Data reported by laboratories without the proper certification will be addressed by the affected enforcement programs.

If you have any questions, or problems are detected concerning your certificate, please contact this office within ten (10) working days.

Sincerely,

Carol F. Smith, Director
Office of Environmental Laboratory Certification
Bureau of Environmental Services

Enclosures

WLLFOIA4312 - 015 - 0168387

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Environmental Laboratory Certification Program

In accordance with the provisions of Regulation 61-81, entitled "State Environmental Laboratory Certification Regulations"

EBERLINE SERVICES OAK RIDGE LAB
601 SCARBORO RD
OAK RIDGE, TENNESSEE 37830

is hereby certified to perform analyses as documented on the attached parameter list(s). This certification does not guarantee validity of data generated, but indicates the laboratory's adherence to prescribed methodology, quality control, records keeping, and reporting procedures. This certificate is the property of S.C. DHEC and must be surrendered upon demand. This certificate is non-transferable and is valid only for the parameters and methodology listed on the attached parameter list(s).

Laboratory Director: MICHAEL MCDOUGALL
Certifying Authority: TN
Date of Issue: September 19, 2012
Date of Expiration: December 15, 2014
Certificate Number: 84013001

Director
Office of Environmental Laboratory Certification

CR-010021 2/11

WLLFOIA4312 - 015 - 0168388

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
ENVIRONMENTAL LABORATORY CERTIFICATION PROGRAM

EBERLINE SERVICES OAK RIDGE LAB (Laboratory ID 84013)
Laboratory Director: MICHAEL MCDOUGALL
Certifying Authority: TN
Certificate Number: 84013001

Date of Issue: September 19, 2012
Expiration Date: December 15, 2014

SAFE DRINKING WATER ACT

INORGANIC - RADIOLOGICAL

GROSS ALPHA	EPA 900.0 (1980)
GROSS BETA	EPA 900.0 (1980)
RADIUM 226	EPA 903.0 (1980)
RADIUM 228	EPA 904.0 (1980)
STRONTIUM 90	EPA 905.0 (1980)
TRITIUM	EPA 906.0 (1980)

State of Tennessee

Department of Environment & Conservation

Division of Water Supply

Certifies That

Eberline Services Laboratory

Having Met the Requirements of the Regulations for the Certification of Laboratories Analyzing Drinking Water is hereby Approved as a

State Certified Laboratory in Radiochemistry

To perform the Analyses as Indicated on the Certified Parameter List For the Public Water Systems of Tennessee

Laboratory ID Number TN02042 - Effective through December 15, 2014

A. Craig LaFever

A. Craig LaFever

Laboratory Certification Manager

Division of Water Supply

This certification is subject to performance on E.P.A. Performance Evaluation Samples, laboratory inspections and payment of annual fees

WLLFOIA4312 - 015 - 0168390

Certified Parameters - 2011

TENNESSEE

Eberline Services | TN02042 | EPA # TN01067 | 12/16/2011

Attn: Ahmed Halouma
601 Scarboro Road
Oak Ridge, TN 37830-7371

Parameter	EPA Parameter #	Approved Method	Study Type	Date Complete	PT Provider / WS #
Radiological					
Cesium-134 (Radioactive)	4270	EPA - 901.1	Proficiency Test	5/19/2011	ERA / RAD-85
Cesium-137 (Radioactive)	4276	EPA - 901.1	Proficiency Test	5/19/2011	ERA / RAD-85
Cobalt-60 (Radioactive)	4142	EPA - 901.1	Proficiency Test	5/19/2011	ERA / RAD-85
Gross Alpha	4000	EPA - 900.0	Proficiency Test	5/19/2011	ERA / RAD-85
Gross Beta	4100	EPA - 900.0	Proficiency Test	5/19/2011	ERA / RAD-85
Radium-226	4020	EPA - 903.0	Proficiency Test	5/19/2011	ERA / RAD-85
Radium-228	4030	EPA - 904.0	Proficiency Test	5/19/2011	ERA / RAD-85
Strontium 89 (Radioactive)	4172	EPA - 905.0	Proficiency Test	5/19/2011	ERA / RAD-85
Strontium 90 (Radioactive)	4174	EPA - 905.0	Proficiency Test	5/19/2011	ERA / RAD-85
Tritium (Radioactive)	4102	EPA - 906.0	Proficiency Test	5/19/2011	ERA / RAD-85
Uranium (Natural)	4006	EPA - 908.0	Proficiency Test	5/19/2011	ERA / RAD-85
Uranium (Radioactive)	4400	ASTM - D 5174-02	Proficiency Test	5/19/2011	ERA / RAD-85

WLLFOIA4312 - 015 - 0168391

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER SUPPLY
6th Floor, L & C TOWER, 401 Church Street
Nashville, Tennessee 37243-1549

December 27, 2011

Mr. Ahmed Halouma, QA Mgr
Eberline Analytical Corporation
601 Scarboro Road
Oak Ridge, TN 37830-7371

Re: Audit Report
Lab # TN02042

Dear Mr. Halouma:

Division of Water Supply personnel visited your laboratory and performed an audit on December 12 and December 13, 2011. We would like to thank you and your staff for your courtesy during the audit.

I. Certification Status

The certification for Radiochemistry analyses shall be valid until December 15, 2015. Continued compliance with the State of Tennessee certification criteria is subject to the USEPA laboratory certification criteria and procedures for quality assurance (*Manual for the Certification of Laboratories Analyzing Drinking Water, Fifth Edition, 2005).*

Eberline Analytical Corporation Laboratory (TN02042) is granted Certification for the Radiochemistry methods and parameters listed on the enclosed Certified parameter list.

II. List of Deviations

No Deviations noted.

III. Remarks

We appreciate the willingness to share detailed explanations of the methodology and quality control. As discussed, please forward us the completed SOPs for Uranium 234 and 238 analysis by alpha spectrometry and the SOPs for Strontium-89 and Strontium-90.

IV. Personnel

Name	Specialty
Michael R. McDougall	Laboratory Manager
Ahmed Halouma	Quality Assurance Manager

If you have any questions please do not hesitate to contact the Laboratory Certification Officers Craig LaFever (615-532-0181) Craig.LaFever@.tn.gov or Prasad Subbanna (865-594-5557) Prasad.Subbanna@tn.gov.

Sincerely,

A. Craig LaFever

A. Craig LaFever
Laboratory Certification Officer
Tennessee Division of Water Supply

cc: file

Enclosure

NELAP - RECOGNIZED

CALIFORNIA STATE

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM BRANCH

CERTIFICATE OF NELAP ACCREDITATION

Is hereby granted to

Eberline Analytical Corporation (EPA# TN01067)

601 Scarboro Road

Oak Ridge, TN 37830

Scope of the Certificate is limited to the
"NELAP Fields of Accreditation"
which accompany this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No.: **08261CA**

Expiration Date: **7/31/2014**

Effective Date: **8/1/2013**

Richmond, California
subject to forfeiture or revocation

Fred Chorske for
David Mazzera, Ph.D., Assistant Division Chief
Division of Drinking Water and Environmental Management

NELAP RECOGNIZED

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM BRANCH

NELAP Fields of Accreditation

Eberline Analytical Corporation (EPA# TN01067)

601 Scarboro Road
Oak Ridge, TN 37830
Phone: (865) 481-0683

Primary AA: UT TN010672012-2

Certificate No. 08261CA
Renew Date: 7/31/2014

106 - Radiochemistry of Drinking Water			
106.010	001	EPA 900.0	Gross Alpha
106.010	002	EPA 900.0	Gross Beta
106.030	003	EPA 901.1	Gamma Emitters
106.050	001	EPA 903.0	Total Alpha Radium
106.050	002	EPA 903.0	Radium-226
106.060	001	EPA 904.0	Radium-228
106.070	001	EPA 905.0	Strontium-89, 90
106.070	002	EPA 905.0	Strontium-89
106.070	003	EPA 905.0	Strontium-90
106.080	001	EPA 906.0	Tritium
106.090	001	EPA 908.0	Uranium
106.480	001	ASTM D5174-97	Uranium
112 - Radiochemistry of Wastewater			
112.010	001	EPA 900.0	Gross Alpha
112.010	002	EPA 900.0	Gross Beta
112.140	002	EPA 901.1	Gamma
112.160	001	EPA 904.0	Radium-228
112.180	001	EPA 906.0	Tritium
112.190	001	EPA 908.0	Uranium
118 - Radiochemistry of Hazardous Waste			
118.010	001	EPA 9310	Gross Alpha
118.010	002	EPA 9310	Gross Beta
118.020	001	EPA 9315	Radium, Total
118.030	001	EPA 9320	Radium-228

As of 7/9/2013 , this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

WLLFOIA4312 - 015 - 0168396

BOBBY JINDAL
GOVERNOR

PEGGY M. HATCH
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES

July 1, 2013

LELAP Lab ID # 05005
AI No. 168684
Accreditation Year FY2014
Renewal due FY 2016

Ms. Saba Arnold Seaver
Eberline Services - Oak Ridge Lab
601 Scarboro Rd
Oak Ridge, Tennessee 37830-7371

Re: Scope of Accreditation

Dear Ms. Arnold Seaver:

The Louisiana Department of Environmental Quality's laboratory accreditation program, in accordance with Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation, accredits this laboratory for Fiscal Year 201 4. This accreditation does not constitute an endorsement of the suitability of the listed methods for any specific purpose. The laboratory is accredited for the method as identified on the application for accreditation; if the method is partially identified on the applicatio n for accreditation, the laboratory is accredited for the versions listed on the current application or referenced in the laboratory standard operating procedure.

National Environmental Laboratory Accreditation Program (NELAP) accreditation is granted **only** for those methods/analytes for which "NELAP" is indicated as the type of accreditation. "STATE" is indicated as the type of accreditation for those methods/analytes for which accreditation by the Louisiana Environmental Laboratory Accreditation Progra m (LELAP) is granted. Accreditation is dependent on the laboratory's successful ongoing compliance with regulations as outlined in the Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation, and with the standards adopted by the NELAP Accreditation Council.

The accreditation certificate is the property of the State of Louisiana. Should your accreditation be suspended or revoked, your laboratory must return the certificate of accreditation to the department and delete any electronic copies until your accreditation status is restored.

LAC 33:I.5313.A and/or NELAC 5.5.10.1 require that the laboratory report include all relevant information. Therefore, the certificate number shall be placed in the upper right corner of all laboratory reports. If the test report includes results of any test for which the laboratory is not accredited, the unaccredited results must be clearly identified as such.

WLLFOIA4312 - 015 - 0168397

We request that you examine the scope of accreditation attachment for accuracy and completeness. If you find that an analyte for which you expected to be accredited is not listed, please examine your records to ensure that:

1. You have met the requirements for successful participation in proficiency test studies as outlined in LAC 33:I.4711 and in the NELAC Standard 2.7.2.

2. In the case of accreditation by recognition, the requested analyte must be listed for the requested method and matrix on both the certificate issued by the Primary Accreditation Body ***and*** on the Louisiana application form.

If after reviewing this information, the scope and/or certificate are inaccurate, please notify us immediately.

If you have any questio ns, please contact your assigned assessor Dr. Alicia B. Ryan , Environmental Scientist at (225) 219-1352.

Sincerely,

Lourdes Iturralde
Administrator
Notifications and Accreditations Section
OES, Public Participation & Permit Support Services Division

LI:PB:abr

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Is hereby granting a Louisiana Environmental Laboratory Accreditation to

Eberline Services - Oak Ridge Lab
601 Scarboro Rd
Oak Ridge, Tennessee 37830-7371

Agency Interest No. 168684

According to the Louisiana Administrative Code, Title 33, Part I, Subpart 3, LABORATORY ACCREDITATION, the State of Louisiana formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part I, Subpart 3 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part I. Please contact the Department of Environmental Quality, Louisiana Environmental Laboratory Accreditation Program (LELAP) to verify the laboratory's scope of accreditation and accreditation status.

Accreditation by the State of Louisiana is not an endorsement or a guarantee of validity of the data generated by the laboratory. To be accredited initially and maintain accreditation, the laboratory agrees to participate in two single-blind, single-concentration PT studies, where available, per year for each field of testing for which it seeks accreditation or maintains accreditation as required in LAC 33:I.4711.

Lourdes Iturralde, Administrator
Notifications and Accreditations Section
Public Participation & Permit Support Services Division

Certificate Number: 05005

Expiration Date: June 30, 2014
Issued On: July 1, 2013

Louisiana Environmental LELAP Accreditation Program

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY
Issue Date: July 1, 2013

Eberline Services - Oak Ridge Lab
AI Number: 168684
Expiration Date: June 30, 2014

601 Scarboro Rd, Oak Ridge, Tennessee 37830-7371

Certificate Number: 05005

Air Emissions

Analyte	Method Name	Method Code	Type	AB
NONE	NONE	NONE	NONE	NONE

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
2830 - Gross-alpha	EPA 900	10112400	NELAP	UT
2840 - Gross-beta	EPA 900	10112400	NELAP	UT
2826 - Gamma Emitters	EPA 901.1	10112808	NELAP	UT
1128 - Radium-223	EPA 903	10113209	NELAP	UT
2960 - Radium-224	EPA 903	10113209	NELAP	UT
2965 - Radium-226	EPA 903	10113209	NELAP	UT
2750 - Total alpha radium	EPA 903	10113209	NELAP	UT
2970 - Radium-228	EPA 904	10113607	NELAP	UT
2995 - Strontium-89	EPA 905	10113801	NELAP	UT
3010 - Strontium-89, 90	EPA 905	10113801	NELAP	UT
3005 - Strontium-90	EPA 905	10113801	NELAP	UT
3030 - Tritium	EPA 906	10114008	NELAP	UT
3035 - Uranium	EPA 908	10114202	NELAP	UT
2830 - Gross-alpha	EPA 9310	10208205	NELAP	UT
2840 - Gross-beta	EPA 9310	10208205	NELAP	UT
100210 - Alpha Emitting Radium Isotopes	EPA 9315	10208409	NELAP	UT
2970 - Radium-228	EPA 9320	10208603	NELAP	UT

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
2830 - Gross-alpha	EPA 9310	10208205	NELAP	UT
2840 - Gross-beta	EPA 9310	10208205	NELAP	UT
100210 - Alpha Emitting Radium Isotopes	EPA 9315	10208409	NELAP	UT
2970 - Radium-228	EPA 9320	10208603	NELAP	UT

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
NONE	NONE	NONE	NONE	NONE

Clients and Customers are urged to verify the laboratory's current certification status with theLouisiana Environmental Laboratory Accreditation Program.

WLLFOIA4312 - 015 - 0168400

COPY

NEW YORK
state department of
HEALTH

Nirav R. Shah, M.D., M.P.H.
Commissioner

Sue Kelly
Executive Deputy Commissioner

LAB ID: 11798

April 01, 2013

MS. MARY L. TURNER
EBERLINE SERVICES-OAK RIDGE LAB
601 SCARBORO ROAD
OAK RIDGE, TN 37830

Certificate Expiration Date:
April 01, 2014

Dear Ms. Turner,

Enclosed are Certificate(s) of Approval issued to your environmental laboratory for the current permit year. The Certificate(s) supersede(s) any previously issued one(s) and is(are) in effect through the expiration date listed. Please carefully examine the Certificate(s) to insure that the categories, subcategories, analytes, and methods for which your laboratory is approved are correct. In addition, verify that your laboratory's name, address, lead technical director, and identification number are accurate.

Pursuant to NYCRR Subpart 55-2.2, original certificates must be posted conspicuously in the laboratory and copies shall be made available to any client of the laboratory upon request.

Pursuant to NYCRR Subpart 55-2.6, any misrepresentation of the Fields of Accreditation (Matrix - Method - Analyte) for which your laboratory is approved may result in denial, suspension, or revocation of your certification. Any use of the Environmental Laboratory Approval Program (ELAP) or National Environmental Laboratory Accreditation Program (NELAP) name, reference to the laboratory's approval status, and/or using the NELAP logo in any catalogs, advertising, business solicitations, proposals, quotations, laboratory analytical reports, or other materials must include the laboratory's ELAP identification number and distinguish between testing for which the laboratory is approved and testing for which the laboratory is not approved.

If you have any questions, please contact ELAP at the New York State Department of Health (NYS DOH), Wadsworth Center, PO Box 509, Albany NY, 12201-0509; by phone at (518) 485-5570; by facsimile at (518) 485-5568; and by email at elap@health.state.ny.us.

Sincerely,

Stephanie E. Ostrowski

STEPHANIE OSTROWSKI, PH.D.
Program Director
Environmental Laboratory Approval Program

WLLFOIA4312 - 015 - 0168401

COPY

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2014
Issued April 01, 2013

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. MARY L. TURNER
EBERLINE SERVICES-OAK RIDGE LAB
601 SCARBORO ROAD
OAK RIDGE, TN 37830

NY Lab Id No: 11798

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Drinking Water Metals III	
Uranium (Mass)	ASTM D5174-97 02 07
Radiological Analytes	
Gross Alpha	EPA 900.0
Gross Beta	EPA 900.0
Photon Emitters	EPA 901.1
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Strontium-89	EPA 905.0
Strontium-90	EPA 905.0
Tritium	EPA 906.0
Uranium (Activity)	EPA 908.0

Serial No.: 48873

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

WLLFOIA4312 - 015 - 0168402

COPY·COPY·COPY·

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2014
Issued April 01, 2013

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. MARY L. TURNER
EBERLINE SERVICES-OAK RIDGE LAB
601 SCARBORO ROAD
OAK RIDGE, TN 37830

NY Lab Id No: 11798

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Radiological Analytes

Gross Alpha	EPA 900.0
Gross Beta	EPA 900.0
Photon Emitters	EPA 901.1
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Strontium-89	EPA 905.0
Strontium-90	EPA 905.0
Tritium	EPA 906.0
Uranium (Activity)	EPA 908.0

Serial No.: 48874

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

WLLFOIA4312 - 015 - 0168403

Texas Commission on Environmental Quality

NELAP-Recognized Laboratory Accreditation is hereby awarded to

Eberline Services - Oak Ridge Laboratory

601 Scarboro Road
Oak Ridge, TN 37830-7371

in accordance with Texas Water Code Chapter 5, Subchapter R, Title 30 Texas Administrative Code Chapter 25, and the National Environmental Laboratory Accreditation Program.

The laboratory's scope of accreditation includes the fields of accreditation that accompany this certificate. Continued accreditation depends upon successful ongoing participation in the program. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current location(s) and accreditation status for particular methods and analyses (www.tceq.texas.gov/goto/lab). Accreditation does not imply that a product, process, system or person is approved by the Texas Commission on Environmental Quality.

Certificate Number: T104704443-13-5
Effective Date: 10/1/2013
Expiration Date: 9/30/2014

Executive Director Texas Commission on Environmental Quality

WLLFO\A4312 - 015 - 0168404

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate: T104704443-13-5
Expiration Date: 9/30/2014
Issue Date: 10/1/2013

Eberline Services - Oak Ridge Laboratory

601 Scarboro Road
Oak Ridge, TN 37830-7371

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Drinking Water***

Method EPA 900.0

Analyte	AB	Analyte ID	Method ID
Gross-alpha	UT	2830	10112400
Gross-beta	UT	2840	10112400

Method EPA 901.1

Analyte	AB	Analyte ID	Method ID
Gross gamma	UT	2855	10112808
Radioactive cesium	UT	2955	10112808

Method EPA 903.0

Analyte	AB	Analyte ID	Method ID
Radium-226	UT	2965	10113209

Method EPA 904.0

Analyte	AB	Analyte ID	Method ID
Radium-228	UT	2970	10113607

Method EPA 905.0

Analyte	AB	Analyte ID	Method ID
Strontium-89	UT	2995	10113801
Strontium-90	UT	3005	10113801

Method EPA 906.0

Analyte	AB	Analyte ID	Method ID
Tritium	UT	3030	10114008

Method EPA 908.0

Analyte	AB	Analyte ID	Method ID
Uranium	UT	3035	10114202

WLLFOIA4312 - 015 - 0168405

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate: T104704443-13-5
Expiration Date: 9/30/2014
Issue Date: 10/1/2013

Eberline Services - Oak Ridge Laboratory

601 Scarboro Road
Oak Ridge, TN 37830-7371

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Non-Potable Water***

Method EPA 900.0

Analyte	AB	Analyte ID	Method ID
Gross-alpha	UT	2830	10112400
Gross-beta	UT	2840	10112400

Method EPA 903.0

Analyte	AB	Analyte ID	Method ID
Total radium	UT	2975	10113209

Method EPA 908.0

Analyte	AB	Analyte ID	Method ID
Uranium	UT	3035	10114202

WLLFOIA4312 - 015 - 0168406

Texas Commission on Environmental Quality

NELAP - Recognized Laboratory Fields of Accreditation

Certificate: T104704443-13-5
Expiration Date: 9/30/2014
Issue Date: 10/1/2013

Eberline Services - Oak Ridge Laboratory

601 Scarboro Road
Oak Ridge, TN 37830-7371

These fields of accreditation supercede all previous fields. The Texas Commission on Environmental Quality urges customers to verify the laboratory's current accreditation status for particular methods and analyses.

Matrix: ***Solid & Chemical Materials***

Method EPA 9310

Analyte	AB	Analyte ID	Method ID
Gross-alpha	UT	2830	10208205
Gross-beta	UT	2840	10208205

WLLFOIA4312 - 015 - 0168407

State of Utah

Department of Health

Environmental Laboratory Certification Program

Certification is hereby granted to

Eberline Services - Oak Ridge Laboratory

601 Scarboro Road
Oak Ridge, TN 37830

Has conformed with the
2009 TNI Standard
Scope of accreditiation is limited to the
State of Utah Accredited Fields of Accreditiation
Which accompanies this Certificate

EPA Number: TN01067
Expiration Date: 9/30/2014
Certificate Number: TN010672013-3

Robyn M. Atkinson, Ph.D, HCLD
Director, Utah Public Health Laboratory

NELAP RECOGNIZED ACCREDITATION BODY

Continued accredited status depends on successful ongoing particitpation in the program.

UTAH DEPARTMENT OF HEALTH

WLLFOIA4312 - 015 - 0168408

State of Utah
Gary R Herbert
Governor
Gregory S Bell
Lieutenant Governor

Utah Department of Health
W. David Patton Ph.D
Executive Director

Division of Disease Control and Prevention
Robyn M. Atkinson, Ph.D, HCLD
Director, Utah Public Health Laboratory

EPA Number: *TN01067* **Attachment to Certificate Number: TN010672013-3**

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: *CWA (Non Potable Water)*			
Method EPA 900			
Gross-alpha	10/1/2013	9/30/2014	UT
Gross-beta	10/1/2013	9/30/2014	UT
Method EPA 901.1			
Cesium-134	10/1/2013	9/30/2014	UT
Cesium-137	10/1/2013	9/30/2014	UT
Gamma Emitters	10/1/2013	9/30/2014	UT
Method EPA 903			
Radium-223	10/1/2013	9/30/2014	UT
Radium-224	10/1/2013	9/30/2014	UT
Radium-226	10/1/2013	9/30/2014	UT
Method EPA 904			
Radium-228	10/1/2013	9/30/2014	UT
Method EPA 905			
Strontium-89	10/1/2013	9/30/2014	UT
Strontium-89, 90	10/1/2013	9/30/2014	UT
Strontium-90	10/1/2013	9/30/2014	UT
Method EPA 906.0			
Tritium	10/1/2013	9/30/2014	UT
Method EPA 908			
Uranium	10/1/2013	9/30/2014	UT

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: ***RCRA (Non Potable Water)***			
Method EPA 9310			
Gross alpha-beta	10/1/2013	9/30/2014	UT
Method EPA 9315			
Total alpha radium	10/1/2013	9/30/2014	UT
Method EPA 9320			
Radium-228	10/1/2013	9/30/2014	UT

UTAH DEPARTMENT OF HEALTH

4431 South 2700 West • Taylorsville, UT 84129 • phone (801) 965-2400 • fax (801) 965-2544
www.health.utah.gov/els/labimp/

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: ***RCRA (Solid & Hazardous Material)***			
Method EPA 9310			
Gross alpha-beta	10/1/2013	9/30/2014	UT
Method EPA 9315			
Total alpha radium	10/1/2013	9/30/2014	UT
Method EPA 9320			
Radium-228	10/1/2013	9/30/2014	UT

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www.health.utah.gov/els/labimp/

WLLFOIA4312 - 015 - 0168411

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: ***SDWA (Potable Water)***			
Method ASTM D5174-02			
Uranium	10/1/2013	9/30/2014	UT
Method EPA 00- 02			
Gross-alpha	10/1/2013	9/30/2014	UT
Method EPA 900.0			
Gross-alpha	10/1/2013	9/30/2014	UT
Gross-beta	10/1/2013	9/30/2014	UT
Method EPA 901.1			
Cesium-134	10/1/2013	9/30/2014	UT
Gamma Emitters	10/1/2013	9/30/2014	UT
Iodine-131	10/1/2013	9/30/2014	UT
Method EPA 903			
Radium-223	10/1/2013	9/30/2014	UT
Radium-224	10/1/2013	9/30/2014	UT
Radium-226	10/1/2013	9/30/2014	UT
Total radium	10/1/2013	9/30/2014	UT
Method EPA 904			
Radium-228	10/1/2013	9/30/2014	UT
Method EPA 905			
Strontium	10/1/2013	9/30/2014	UT
Strontium-89	10/1/2013	9/30/2014	UT
Strontium-90	10/1/2013	9/30/2014	UT
Method EPA 906			
Tritium	10/1/2013	9/30/2014	UT
Method EPA 907.0			
Americium-241	10/1/2013	9/30/2014	UT
Curium-242	10/1/2013	9/30/2014	UT
Curium-243	10/1/2013	9/30/2014	UT
Curium-244	10/1/2013	9/30/2014	UT
Neptunium-237	10/1/2013	9/30/2014	UT
Plutonium-238	10/1/2013	9/30/2014	UT
Plutonium-239	10/1/2013	9/30/2014	UT
Plutonium-240	10/1/2013	9/30/2014	UT
Thorium	10/1/2013	9/30/2014	UT
Uranium	10/1/2013	9/30/2014	UT
Method EPA 908			
Uranium	10/1/2013	9/30/2014	UT

The Utah Environmental Laboratory Certification Program (ELCP) encourages clients and data users to verify the most current certification letter for the authorized method.

The analytes by method which a laboratory is authorized to perform at any given time will be those indicated in the most recent certificate letter. The most recent certification letter supersedes all previous certification or authorization letters. It is the certified laboratory's responsibility to review this letter for discrepancies. The certified laboratory must document any discrepancies in this letter and send notice to this bureau within 15 days of receipt. This certificate letter will be recalled in the event your laboratory's certification is revoked.

UTAH DEPARTMENT OF HEALTH

4431 South 2700 West • Taylorsville, UT 84129 • phone (801) 965-2400 • fax (801) 965-2544
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State of Utah
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Utah Department of Health
W. David Patton Ph.D
Executive Director

Division of Disease Control and Prevention
Robyn M. Atkinson, Ph.D, HCLD
Director, Utah Public Health Laboratory

EPA Number: ***TN01067*** **Attachment to Certificate Number: TN010672013-3**

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: ***CWA (Non Potable Water)***			
Method EPA 900			
Gross-alpha	10/1/2013	9/30/2014	UT
Gross-beta	10/1/2013	9/30/2014	UT
Method EPA 901.1			
Cesium-134	10/1/2013	9/30/2014	UT
Cesium-137	10/1/2013	9/30/2014	UT
Gamma Emitters	10/1/2013	9/30/2014	UT
Method EPA 903			
Radium-223	10/1/2013	9/30/2014	UT
Radium-224	10/1/2013	9/30/2014	UT
Radium-226	10/1/2013	9/30/2014	UT
Method EPA 904			
Radium-228	10/1/2013	9/30/2014	UT
Method EPA 905			
Strontium-89	10/1/2013	9/30/2014	UT
Strontium-89, 90	10/1/2013	9/30/2014	UT
Strontium-90	10/1/2013	9/30/2014	UT
Method EPA 906.0			
Tritium	10/1/2013	9/30/2014	UT
Method EPA 908			
Uranium	10/1/2013	9/30/2014	UT

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: ***RCRA (Non Potable Water)***			
Method EPA 9310			
Gross alpha-beta	10/1/2013	9/30/2014	UT
Method EPA 9315			
Total alpha radium	10/1/2013	9/30/2014	UT
Method EPA 9320			
Radium-228	10/1/2013	9/30/2014	UT

UTAH DEPARTMENT OF HEALTH

4431 South 2700 West • Taylorsville, UT 84129 • phone (801) 965-2400 • fax (801) 965-2544
www.health.utah.gov/els/labimp/

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: ***RCRA (Solid & Hazardous Material)***			
Method EPA 9310			
Gross alpha-beta	10/1/2013	9/30/2014	UT
Method EPA 9315			
Total alpha radium	10/1/2013	9/30/2014	UT
Method EPA 9320			
Radium-228	10/1/2013	9/30/2014	UT

UTAH DEPARTMENT OF HEALTH

4431 South 2700 West • Taylorsville, UT 84129 • phone (801) 965-2400 • fax (801) 965-2544
www.health.utah.gov/els/labimp/

Eberline Services - Oak Ridge Laboratory

	Start Date	Expires	AB
Program/Matrix: ***SDWA (Potable Water)***			
Method ASTM D5174-02			
Uranium	10/1/2013	9/30/2014	UT
Method EPA 00- 02			
Gross-alpha	10/1/2013	9/30/2014	UT
Method EPA 900.0			
Gross-alpha	10/1/2013	9/30/2014	UT
Gross-beta	10/1/2013	9/30/2014	UT
Method EPA 901.1			
Cesium-134	10/1/2013	9/30/2014	UT
Gamma Emitters	10/1/2013	9/30/2014	UT
Iodine-131	10/1/2013	9/30/2014	UT
Method EPA 903			
Radium-223	10/1/2013	9/30/2014	UT
Radium-224	10/1/2013	9/30/2014	UT
Radium-226	10/1/2013	9/30/2014	UT
Total radium	10/1/2013	9/30/2014	UT
Method EPA 904			
Radium-228	10/1/2013	9/30/2014	UT
Method EPA 905			
Strontium	10/1/2013	9/30/2014	UT
Strontium-89	10/1/2013	9/30/2014	UT
Strontium-90	10/1/2013	9/30/2014	UT
Method EPA 906			
Tritium	10/1/2013	9/30/2014	UT
Method EPA 907.0			
Americium-241	10/1/2013	9/30/2014	UT
Curium-242	10/1/2013	9/30/2014	UT
Curium-243	10/1/2013	9/30/2014	UT
Curium-244	10/1/2013	9/30/2014	UT
Neptunium-237	10/1/2013	9/30/2014	UT
Plutonium-238	10/1/2013	9/30/2014	UT
Plutonium-239	10/1/2013	9/30/2014	UT
Plutonium-240	10/1/2013	9/30/2014	UT
Thorium	10/1/2013	9/30/2014	UT
Uranium	10/1/2013	9/30/2014	UT
Method EPA 908			
Uranium	10/1/2013	9/30/2014	UT

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The analytes by method which a laboratory is authorized to perform at any given time will be those indicated in the most recent certificate letter. The most recent certification letter supersedes all previous certification or authorization letters. It is the certified laboratory's responsibility to review this letter for discrepancies. The certified laboratory must document any discrepancies in this letter and send notice to this bureau within 15 days of receipt. This certificate letter will be recalled in the event your laboratory's certification is revoked.

UTAH DEPARTMENT OF HEALTH

4431 South 2700 West • Taylorsville, UT 84129 • phone (801) 965-2400 • fax (801) 965-2544
www.health.utah.gov/els/labimp/

COMMONWEALTH of VIRGINIA

Department of General Services

Division of Consolidated Laboratory Services

600 North 5th Street
Richmond, Virginia 23219-3691
(804) 648-4480
FAX (804) 692-0416

12/10/2013

Michael R Mcdougall
EBERLINE SERVICES OAK RIDGE LABORATORY
601 Scarboro Road
Oak Ridge TN 37830

VELAP ID: 460218

Dear Michael R Mcdougall:

EBERLINE SERVICES OAK RIDGE LABORATORY has been granted secondary accreditation pursuant to the provisions of 1VAC30-46 and the National Environmental Laboratory Accreditation Program (NELAP) by the Division of Consolidated Laboratory Services (DCLS). Enclosed please find Certificate 2544 and the corresponding Scope of Accreditation which are valid until 12/14/2014. The certificate must be conspicuously displayed in the laboratory along with the associated Scope of Accreditation.

Your laboratory is required to notify the DCLS Virginia Environmental Laboratory Accreditation Program (VELAP) in writing of any changes in key accreditation criteria within 30 calendar days of the change per 1VAC30-46-90 A. This requirement includes changes in ownership, location, key personnel, and major instrumentation.

If your laboratory wishes to change its scope of accreditation an application must be submitted in accordance with the provisions of 1VAC30-46-90 B. These changes are subject to fees as outlined in 1VAC30-46-150 F 1.

Additionally, a laboratory holding secondary accreditation with DCLS is responsible for assuring that DCLS has current information regarding the laboratory's primary accreditation. Upon any change in the status of any field of accreditation, a secondary laboratory must notify DCLS of the exact nature of the change and provide a copy of the laboratory's new primary certificate.

WLLFOIA4312 - 015 - 0168417

If you have any questions, please contact the VELAP program office at (804)648-4480.

Sincerely yours,

Cathy Westerman
Manager, Virginia Environmental Laboratory Accreditation Program

Enclosures

WLLFOIA4312 - 015 - 0168418

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF GENERAL SERVICES
DIVISION OF CONSOLIDATED LABORATORY SERVICES

Certifies that

VA Laboratory ID#: 460218
EBERLINE SERVICES OAK RIDGE LABORATORY

601 SCARBORO ROAD
OAK RIDGE, TN 37830

Owner: GLENROSE INSTRUMENT INC, DR. SHELTON CLARK - PRESIDENT
Operator: EBERLINE SERVICES - OAK RIDGE LABORATORY
Responsible Official: MICHAEL R MCDOUGALL

Having met the requirements of 1 VAC 30-46
and the National Environmental Laboratory Accreditation Conference 2003 Standard

is hereby approved as an

Accredited Laboratory

As more fully described in the attached Scope of Accreditation

Effective Date: **December 15, 2013**
Expiration Date: **December 14, 2014**
Certificate # 2544

Thomas L. York, Ph.D., HCLD
DGS Deputy Director for Laboratories

Continued accreditation status depends on successful ongoing participation in the program.
Certificate to be conspicuously displayed at the laboratory.
Not valid unless accompanied by a valid Virginia Environmental Laboratory Accreditation Program (VELAP) Scope of Accreditation.
Customers are urged to verify the laboratory's current accreditation status.

Certificate Not Transferable

Surrender Upon Revocation

WLLFOIA4312 - 015 - 0168419

Commonwealth of Virginia

Department of General Services
Division of Consolidated Laboratory Services

Scope of Accreditation

VELAP Certificate No.: 2544

EBERLINE SERVICES OAK RIDGE LABORATORY
601 SCARBORO ROAD
OAK RIDGE, TN 37830

Virginia Laboratory ID: 460218
Effective Date: December 15, 2013
Expiration Date: December 14, 2014

DRINKING WATER

METHOD	ANALYTE	PRIMARY
EPA 900.0 1980	GROSS ALPHA	UT
EPA 901.1	CESIUM-134	UT
EPA 903.0	RADIUM-226	UT
EPA 904.0	RADIUM-228	UT
EPA 905.0 1980	STRONTIUM-90	UT
EPA 908.0	URANIUM	UT

METHOD	ANALYTE	PRIMARY
EPA 900.0 1980	GROSS BETA	UT
EPA 901.1	GAMMA EMITTERS	UT
EPA 903.0	TOTAL ALPHA RADIUM	UT
EPA 905.0 1980	STRONTIUM-89	UT
EPA 906.0	TRITIUM	UT

NON-POTABLE WATER

METHOD	ANALYTE	PRIMARY
EPA 900.0 1980	GROSS ALPHA	UT
EPA 901.1	GAMMA EMITTERS	UT
EPA 904.0	RADIUM-228	UT
EPA 905.0 1980	STRONTIUM-90	UT
EPA 908.0	URANIUM	UT
EPA 9310 (9/86)	GROSS BETA	UT
EPA 9320 (9/86)	RADIUM-228	UT

METHOD	ANALYTE	PRIMARY
EPA 900.0 1980	GROSS BETA	UT
EPA 903.0	RADIUM-226	UT
EPA 905.0 1980	STRONTIUM-89	UT
EPA 906.0	TRITIUM	UT
EPA 9310 (9/86)	GROSS ALPHA	UT
EPA 9315 (9/86)	TOTAL ALPHA RADIUM	UT

This Scope of Accreditation must accompany the Certificate issued by Virginia DCLS with the same Certificate Number indicated above.

WLLFOIA4312 - 015 - 0168420

The State of Washington Department of Ecology

Eberline Services - Oak Ridge Lab
Oak Ridge, TN

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITE D LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective June 15, 2013 and shall expire June 14, 2014.

Witnessed under my hand on June 20, 2013

Alan D. Rue
Lab Accreditation Unit Supervisor

Laboratory ID
C887

WLLFOIA4312 - 015 - 0168421

WASHINGTON STATE DEPARTMENT OF ECOLOGY

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

SCOPE OF ACCREDITATION

Eberline Services - Oak Ridge Lab

Oak Ridge, TN

is accredited for the analytes listed below using the methods indicated. Full accreditation is granted unless stated otherwise in a note. Accreditation for U.S. Environmental Protection Agency (EPA) "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846) is for the latest version of the method. SM refers to EPA approved editions of "Standard Methods for the Examination of Water and Wastewater." ASTM is the American Society for Testing and Materials. Other references are described in notes.

Matrix/Analyte	Method	Notes
Drinking Water		
Gross Alpha	EPA 900.0-80	1
Gross Beta	EPA 900.0-80	1
Gamma Emitters	EPA 901.1-80	1
Radium-226	EPA 903.0-80	1
Radium-228	EPA 904.0-80	1
Strontium-90	EPA 905.0-80	1
Tritium	EPA 906.0-80	1
Total Uranium	EPA 908.0-80	1
Non-Potable Water		
Gross Alpha	EPA 900.0-80	1
Gross Beta	EPA 900.0-80	1
Gamma Emitters	EPA 901.1-80	1
Radium-226	EPA 903.0-80	1
Radium-228	EPA 904.0-80	1
Strontium-90	EPA 905.0-80	1
Tritium	EPA 906.0-80	1
Total Uranium	EPA 908.0-80	1
Solid and Chemical Materials		
Gross Alpha	EPA 9310_(9/86)	1
Gross Beta	EPA 9310_(9/86)	1
Radium-226	EPA 9315_(9/86)	1

WLLFOIA4312 - 015 - 0168422

Matrix/Analyte	Method	Notes
Radium-228	EPA 9320_(9/86)	1

Accredited Parameter Note Detail

(1) Accreditation based in part on recognition of Utah NELAP accreditation.

06/20/2013

Authentication Signature
Alan D. Rue, Lab Accreditation Unit Supervisor

Date

WLLFOIA4312 - 015 - 0168423

The Alabama Department of Environmental Management

certifies that

Eberline Services Laboratory

Having met Department laboratory certification criteria, is approved to conduct Drinking Water analyses for the following:

Radionuclides

Effective January 1, 2014 through December 31, 2014

Dennis A. Hanson

Alabama Department of Environmental Management

Laboratory Number **41620**

QA/QC RECEIVED
DATE 1/21/14 INITIALS MST

© GOES 748

LITHO IN U.S.A.

WLLFOIA4312 - 015 - 0168424

Eberline Services Laboratory
Expires December 31, 2014

Analyte	Method
Gross Alpha	900.0
Gross Beta	900.0
Radium-226	903.0
Radium-228	904.0
Strontium-89	905.0
Strontium-90	905.0
Tritium	906.0
Uranium	908.0
Uranium	ASTM-D 5174-02

WLLFOIA4312 - 015 - 0168425

COPY

NEW YORK
state department of
HEALTH

Nirav R. Shah, M.D., M.P.H.
Commissioner

Sue Kelly
Executive Deputy Commissioner

LAB ID: 11798

April 01, 2014

MS. MARY L. TURNER
EBERLINE SERVICES-OAK RIDGE LAB
601 SCARBORO ROAD
OAK RIDGE, TN 37830

Certificate Expiration Date:
April 01, 2015

Dear Ms. Turner,

Enclosed are Certificate(s) of Approval issued to your environmental laboratory for the current permit year. The Certificate(s) supersede(s) any previously issued one(s) and is(are) in effect through the expiration date listed. Please carefully examine the Certificate(s) to insure that the categories, subcategories, analytes, and methods for which your laboratory is approved are correct. In addition, verify that your laboratory's name, address, lead technical director, and identification number are accurate.

Pursuant to NYCRR Subpart 55-2.2, original certificates must be posted conspicuously in the laboratory and copies shall be made available to any client of the laboratory upon request.

Pursuant to NYCRR Subpart 55-2.6, any misrepresentation of the Fields of Accreditation (Matrix - Method - Analyte) for which your laboratory is approved may result in denial, suspension, or revocation of your certification. Any use of the Environmental Laboratory Approval Program (ELAP) or National Environmental Laboratory Accreditation Program (NELAP) name, reference to the laboratory's approval status, and/or using the NELAP logo in any catalogs, advertising, business solicitations, proposals, quotations, laboratory analytical reports, or other materials must include the laboratory's ELAP identification number and distinguish between testing for which the laboratory is approved and testing for which the laboratory is not approved.

If you have any questions, please contact ELAP at the New York State Department of Health (NYS DOH), Wadsworth Center, PO Box 509, Albany NY, 12201-0509; by phone at (518) 485-5570; by facsimile at (518) 485-5568; and by email at elap@health.state.ny.us.

Sincerely,

Stephanie E. Ostrowski

STEPHANIE OSTROWSKI, PH.D.
Program Director
Environmental Laboratory Approval Program

WLLFOIA4312 - 015 - 0168426

COPY

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2015
Issued April 01, 2014

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. MARY L. TURNER
EBERLINE SERVICES-OAK RIDGE LAB
601 SCARBORO ROAD
OAK RIDGE, TN 37830

NY Lab Id No: 11798

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES NON POTABLE WATER
All approved analytes are listed below:

Radiological Analytes	
Gross Alpha	EPA 900.0
Gross Beta	EPA 900.0
Photon Emitters	EPA 901.1
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Strontium-89	EPA 905.0
Strontium-90	EPA 905.0
Tritium	EPA 906.0
Uranium (Activity)	EPA 908.0

Serial No.: 50856

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

WLLFOIA4312 - 015 - 0168427

COPY

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2015
Issued April 01, 2014

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. MARY L. TURNER
EBERLINE SERVICES-OAK RIDGE LAB
601 SCARBORO ROAD
OAK RIDGE, TN 37830

NY Lab Id No: 11798

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2003) for the category ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:

Drinking Water Metals III	
Uranium (Mass)	ASTM D5174-97 02 07
Radiological Analytes	
Gross Alpha	EPA 900.0
Gross Beta	EPA 900.0
Photon Emitters	EPA 901.1
Radium-226	EPA 903.0
Radium-228	EPA 904.0
Strontium-89	EPA 905.0
Strontium-90	EPA 905.0
Tritium	EPA 906.0
Uranium (Activity)	EPA 908.0

Serial No.: 50855

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

WLLFOIA4312 - 015 - 0168428

Appendix C

Laboratory Specifications

WLLFOIA4312 - 015 - 0168429

ANALYTICAL SPECIFICATIONS
SUBSURFACE SOIL SAMPLES

Provide labor, materials, and equipment to perform analyses of soil samples in accordance with the following requirements:

A. General

1) Analyses to be performed by standardized, industry-accepted methods (e.g., EPA 901.1 or equivalent for gamma-ray spectrometry, EML Th-01 Modified for isotopic thorium analysis by alpha spec, etc.).
2) Copies of procedures for sample preparation and analysis, interpretation of results, and quality assurance/quality control to be provided to USA Environment on request.
3) Laboratory license or authorization to receive/possess radioactive materials at quantities and concentrations anticipated for this project to be provided on request.
4) Laboratory to provide, on request, proof of satisfactory performance evaluations from National Environmental Laboratory Accreditation Program (NELAP), Department of Energy Consolidated Accreditation Program (DOECAP), or mutually agreeable equivalent for the analytical procedures being requested for this project.
5) The client reserves the right to perform an audit of the laboratory activities, relative to these requested services, at a mutually agreeable time.

B. Analyses

1) The sample will be weighed, dried and homogenized and re-weighed after drying to enable results to be reported in terms of concentration per dry weight (pCi/g). The wet weight to dry weight ratio is to be determined and reported for each sample.
2) Aliquots of soil sufficient to perform the requested alpha spectral analyses will be extracted from the homogenized soil. Each aliquot is to be weighed.
3) Isotopic uranium and thorium analyses will be performed using alpha spectroscopy. Analytical parameters for alpha spectroscopy analyses are to be selected to attain minimum detection sensitivities of 0.2 pCi/g or lower for uranium-234, uranium-238, thorium 230, and thorium- 232. Results for the following radionuclides are to be reported for each sample:
    a. uranium-234,
    b. uranium-235,
    c. uranium-238,
    d. thorium-230, and
    e. thorium-232.
4) An aliquot of the remaining sample will be sealed in calibrated-geometry container and held for a minimum of 30 days to assure radon/radon daughter equilibrium up to the lead-210 member of the radium-226 decay series.
5) Samples are to be analyzed after 30 days using high-resolution gamma-ray spectrometry. Results are to be reported for all detected gamma emitters. In addition, the results for the following radionuclides will be reported even if they do not meet minimum detectable criteria:

WLLFOIA4312 - 015 - 0168430

bismuth-214,
lead-214,
actinium-228,
lead-210
protactinium-231 and
potassium-40.

6) Retain the analyzed samples, pending further instructions from Auxier & Associates.

C. Detection Limits

If a named radionuclide of concern is not detected in the sample, the minimum detectable concentration reported for that analyte in that sample will not exceed the detection limit presented in Table 1.

Table 1 Detection Limits for Named Radionuclides

Radionuclides	Required Detection Limit (pCi/g)	Analytical Method (pCi/g)
U-238	0.2	EML U-02 Modified (Alpha Spec)
U-235	0.2	EML U-02 Modified (Alpha Spec)
U-234	0.2	EML U-02 Modified (Alpha Spec)
Th-232	0.2	EML Th-01 Modified (Alpha Spec)
Th-230	0.2	EML Th-01 Modified (Alpha Spec)
Pa-231	1.0	LANL ER-130 Modified (Gamma Spec)
Ac-228	0.2	LANL ER-130 Modified (Gamma Spec)
Bi-214	0.2	LANL ER-130 Modified (Gamma Spec)
Pb-214	0.2	LANL ER-130 Modified (Gamma Spec)
Pb-210	1.0	LANL ER-130 Modified (Gamma Spec)
K-40	2.0	LANL ER-130 Modified (Gamma Spec)

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D. Data Packages

When reporting data, the laboratory will provide summaries of analytical results to Marsha Joseph and Michael Bollenbacher of Auxier & Associates by fax or email as they become available. Complete data packages in .pdf format should be sent to Marsha Joseph and Terri Eitt of Auxier & Associates. after laboratory QA/QC has been completed. Complete data packages containing the reported results should include the following information:

1) Identification of any problems encountered during analysis,
2) Identification of sample numbers assigned in the field and at the laboratory for all samples in the data package, including indication of the quality control sample numbers associated with batches of Site sample numbers,
3) Documentation of the chain of custody for all samples in the data package,
4) Report of analyte concentrations and units for all samples in the data package, including all quality control samples,
5) Documentation of raw laboratory data for all samples in the data package,
6) Documentation of instrument detection limits for each analyte in the data package,
7) Documentation of relative percent difference results for all quality control samples reported in this manner (spikes, calibration checks, duplicates, method blanks, and laboratory control samples),
8) Documentation of the definitions of all laboratory data qualification codes, and
9) Quality control data packages for equipment utilized in these analyses and covering time period over which these analyses were conducted.

The analytical laboratory will perform checks of data transcription and computation on each data package before transmittal to the client.

E. EDD Recipients

mikeb@auxier.com	Mike Bollenbacher
cgreene@auxier.com	Cecilia Greene
mjoseph@auxier.com	Marsha Joseph
dfeezor@feezorengineering.com	Dan Feezor
paulrosasco@emsidenver.com	Paul Rosasco
peastvold@feezorengineering.com	Paul Eastvold

F. Complete Data (pdf) Recipients

mjoseph@auxier.com	Marsha Joseph
teitt@auxier.com	Terri Eitt

ANALYTICAL SPECIFICATIONS
VEGETATION SAMPLES

Provide labor, materials, and equipment to perform analyses of vegetation samples in accordance with the following requirements:

A. General

1) Analyses to be performed by standardized, industry-accepted methods (e.g., EPA 901.1 or equivalent for gamma-ray spectrometry, EML Th-01 Modified for isotopic thorium analysis by alpha spec, etc.).
2) Copies of procedures for sample preparation and analysis, interpretation of results, and quality assurance/quality control to be provided to Auxier & Associates on request.
3) Laboratory license or authorization to receive/possess radioactive materials at quantities and concentrations anticipated for this project to be provided on request.
4) Laboratory to provide, on request, proof of satisfactory performance evaluations from National Environmental Laboratory Accreditation Program (NELAP), Department of Energy Consolidated Accreditation Program (DOECAP), or mutually agreeable equivalent for the analytical procedures being requested for this project.
5) The client reserves the right to perform an audit of the laboratory activities, relative to these requested services, at a mutually agreeable time.

B. Analyses

1) The sample will be ashed and weighed to enable results to be reported in terms of concentration per dry weight (pCi/g). The wet weight to dry weight ratio is to be determined and reported for each sample.
2) Aliquots of vegetation sufficient to perform the requested alpha spectral analyses will be extracted from the ashed sample. Each aliquot is to be weighed.
3) Isotopic uranium and thorium analyses will be performed using alpha spectroscopy. Analytical parameters for alpha spectroscopy analyses are to be selected to attain minimum detection sensitivities of 0.2 pCi/g or lower for uranium-234, uranium-238, thorium 230, and thorium- 232. Results for the following radionuclides are to be reported for each sample:
    a. uranium-234,
    b. uranium-235,
    c. uranium-238,
    d. thorium-230, and
    e. thorium-232.
4) Samples are to be analyzed using high-resolution gamma-ray spectrometry. Results are to be reported for all detected gamma emitters. In addition, the results for the following radionuclides will be reported even if they do not meet minimum detectable criteria:

    bismuth-214,
    lead-214,
    actinium-228,
    lead-210

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protactinium-231 and
potassium-40.

5) Retain the analyzed samples, pending further instructions from Auxier & Associates.

C. Detection Limits

If a named radionuclide of concern is not detected in the sample, the minimum detectable concentration reported for that analyte in that sample will not exceed the detection limit presented in Table 1.

Table 1 Detection Limits for Named Radionuclides

Radionuclides	Required Detection Limit (pCi/g)	Analytical Method (pCi/g)
U-238	0.2	EML U-02 Modified (Alpha Spec)
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Pa-231	1.0	LANL ER-130 Modified (Gamma Spec)
Ac-228	0.2	LANL ER-130 Modified (Gamma Spec)
Bi-214	0.2	LANL ER-130 Modified (Gamma Spec)
Pb-214	0.2	LANL ER-130 Modified (Gamma Spec)
Pb-210	1.0	LANL ER-130 Modified (Gamma Spec)
K-40	2.0	LANL ER-130 Modified (Gamma Spec)

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3) Documentation of the chain of custody for all samples in the data package,
4) Report of analyte concentrations and units for all samples in the data package, including all quality control samples,
5) Documentation of raw laboratory data for all samples in the data package,
6) Documentation of instrument detection limits for each analyte in the data package,
7) Documentation of relative percent difference results for all quality control samples reported in this manner (spikes, calibration checks, duplicates, method blanks, and laboratory control samples),
8) Documentation of the definitions of all laboratory data qualification codes, and
9) Quality control data packages for equipment utilized in these analyses and covering time period over which these analyses were conducted.

The analytical laboratory will perform checks of data transcription and computation on each data package before transmittal to the client.

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mikeb@auxier.com	Mike Bollenbacher
cgreene@auxier.com	Cecilia Greene
mjoseph@auxier.com	Marsha Joseph
dfeezor@feezorengineering.com	Dan Feezor
paulrosasco@emsidenver.com	Paul Rosasco
peastvold@feezorengineering.com	Paul Eastvold

F. Complete Data (pdf) Recipients

mjoseph@auxier.com	Marsha Joseph
teitt@auxier.com	Terri Eitt

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